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United States
Department of
Agriculture

Food Safety
and Inspection
Service

Science and
Technology

Compound Evaluation and Analytical Capability National Residue Program Plan 1990

SCIENCE AND TECHNOLOGY
FOOD SAFETY AND INSPECTION SERVICE

COMPOUND EVALUATION AND ANALYTICAL CAPABILITY
1990 NATIONAL RESIDUE PROGRAM PLAN

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National Residue Program

The Food Safety and Inspection Service (FSIS) of the U.S. Department of Agriculture (USDA) as part of its National Residue Program collects samples of meat and poultry at slaughtering establishments under its inspection authority and from import shipments at the ports of entry. The samples are analyzed for the presence of unacceptable residue concentrations of pesticides, animal drugs, and other potentially hazardous chemicals that may contaminate meat and poultry. These activities are carried out as part of the Agency's responsibilities under the Federal Meat Inspection Act and the Poultry Products Inspection Act to ensure that USDA-inspected products in commerce are safe, wholesome, and free of adulterating residues.

Purpose of Document

This document--now in its seventh edition--details the activities of the Food Safety and Inspection Service (FSIS) in its evaluation of compounds that may be present in meat and poultry and its development and implementation of analytical methods for detecting those compounds; it includes the National Residue Program Plan. The document serves as a reference source for those concerned with food safety and with FSIS activities in that area.

Section 1

Section 1 includes "Criteria for Compound Evaluation," which describes the procedure followed by FSIS in evaluating compounds for inclusion in the National Residue Program, and the "List of Compounds Considered." The list was compiled by reference to the separate entries in the Code of Federal Regulations (CFR) and the New Animal Drug Application (NADA) listing of the Food and Drug Administration. The list provides the compound name and appropriate CFR or NADA references. NADA references are used for approved animal drugs not listed in the CFR. The third column indicates whether the compound was mentioned in the 1979 General Accounting Office (GAO) Report, "Problems in Preventing the Marketing of Raw Meat and Poultry Containing Potentially Harmful Residues" (Publication number HRD-79-10). The fourth column gives the ranking assigned to the compound in the National Residue Program. Also included is a list of cross-referenced compounds.

Section 2

Section 2 is a list of tolerances and action levels for the compounds.

Section 3

Section 3 defines the types of methods used by FSIS to conduct analyses and their suitability for regulatory use; defines key terms used to describe the methods; and lists the analytical methods for compounds in alphabetical order.

Section 4

Section 4 is an historical chart indicating the compounds included in the National Residue Program during a ten-year period and the specific years in which a compound was included.

Section 5

Section 5 is the National Residue Program Plan for the calendar year 1990, which describes domestic and import program activities. The plan is a guide based on current information, assessment of precedence for testing, and FSIS analytical capability. It is dependent upon our having full staffing and is therefore affected by loss of personnel. The plan will be modified during the year as new information alters the original assessment.

PREFACE

Changing Field

The information contained in this document represents the state of FSIS Science affairs as of July 1, 1989. Past revisions and those expected in the future reflect the dynamic nature of a scientific and technological field that is constantly in flux.

Address for Comments

Please send comments regarding any aspects of the document to:

*Jeffrey Brown, Editor; USDA, FSIS, Science and Technology Program
300 12th Street SW, Washington, DC 20250*

January, 1990

Section 1

CRITERIA FOR COMPOUND EVALUATION AND RANKING

Introduction

Livestock and poultry may be exposed to many compounds during their life cycle. These compounds include primarily:

Pesticide chemicals approved for direct application to livestock and poultry or for treating crops that become components of animal feed or that are used in some way in the farm environment

Animal drugs used to treat or prevent disease or otherwise enhance production

Environmental contaminants

The Environmental Protection Agency (EPA) and the Food and Drug Administration (FDA) establish the acceptable levels or limits of residues (tolerances or action levels) for these compounds in their respective areas of responsibility (pesticides, EPA; animal drugs, environmental contaminants, FDA) and the approved methods of use for specific crops or animals that ensure that limits will not be exceeded. If limits are not established for unavoidable contaminants, FSIS may request that FDA recommend action levels. Exposure of animals to environmental contaminants, or the use of pesticides or animal drugs in a way that does not conform with approved uses, can result in unacceptable amounts of residues of these chemicals in the edible tissues of animals at slaughter.

CFR References

Tolerances for these chemicals are listed in the Code of Federal Regulations (CFR) in 40 CFR 180 for pesticides, in 21 CFR 556 for animal drugs, and 21 CFR 109 for unavoidable contaminants. The approved use conditions for animal drugs are given in 21 CFR in parts 520, 522, 524, 526, 529 (new animal drugs not subject to certification), 540, 544, 546, 548 (antibiotic drugs for animal use), and 558 (new animal drugs for use in animal feed).

Need for Criteria

It is not feasible to monitor for residues of all of these chemicals in meat and poultry, nor is this necessary to adequately protect public health. It is, however, important to assess the likelihood that animals exposed to these chemicals may contain residues at levels of concern, and to conduct monitoring, when test methods are available, for those chemicals that are most likely to present the greatest potential risk. A hierarchical compound-assessment scheme is used for this purpose.

Ranking System

Each compound is evaluated on a number of factors, to judge the potential for animal exposure and significance for human health, including:

Amount of actual or probable use

Conditions of use as related to residues at slaughter

Potential for misuse to result in harmful residues

CRITERIA FOR COMPOUND EVALUATION AND RANKING

Metabolic patterns of the chemical in animals, plants, and the environment, including the bioavailability and persistence of residues

Toxicity of the residue

The combined assessment of these factors is used to assign the chemical to one of four categories A, B, C, or D, which represent in descending order the potential for harmful residues to occur in animals at slaughter. ("A-B-C" indicates compounds of greater or lesser importance for the commitment of resources; "D" denotes either "insignificant" or "not yet ranked.") A new evaluation system has been developed; see the discussion below.

Selection of Compounds for Monitoring

Compounds are selected for monitoring and included in a plan for the calendar year based on several factors, including:

Compound ranking assigned

Whether a practical test method is available and is suitable for regulatory use

Whether the compound is measurable in a multi-residue method with which many compounds, even though all may not be assigned a high ranking, can be tested for at a relatively low cost

Monitoring or other experience that shows whether adulterating residues are present in meat and poultry

Not all of the hundreds of animal drugs and pesticides listed in the CFR are likely to expose animals to harmful residues. FSIS works from a list of about 400 compounds that includes certain environmental contaminants in addition to animal drugs and pesticides (Section 1.B). At present FSIS has suitable regulatory methods of analysis for 172 of these compounds. Some compounds are routinely included in monitoring because experience shows that without active enforcement adulterating residues will occur. Other compounds may be included in monitoring on a cyclical basis to confirm periodically that a potential residue problem does not exist. Cycling of compounds in monitoring allows the agency to include more compounds in the program than would otherwise be possible within its resources. Compounds rotated out of the program for a specific year are not disregarded; if the need arises, they can be added during that year. Over the last ten years, virtually all the residues for which a suitable method was available have been monitored, except when a compound had an especially low rank.

In 1989 FSIS planned to conduct 96,032 sample unit analyses for 120 compounds; in 1990 FSIS plans to conduct 92,629 sample unit analyses for 133 compounds. Table VI in Section 5 of this document shows the resource expenditure required by the sampling plan.

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1.A.2

CRITERIA FOR COMPOUND EVALUATION AND RANKING

A Dynamic System

The process of compound evaluation and ranking is a dynamic one. Additional compounds have to be considered in the system, agricultural use practices change, and additional research on a compound's toxicity and its potential for leaving harmful residues may affect previous rankings. The agency uses an advisory board of scientists from EPA, FDA, and USDA (FSIS and the Agricultural Marketing Service) to identify significant new information that may affect a compound or ranking or indicate an urgent need for monitoring. This advisory relationship is defined in the Memorandum of Understanding among the three agencies published in the Federal Register on January 16, 1985.

Compound Evaluation System (CES)

In the 1985 edition of this document, FSIS-Science (now Science and Technology) announced the implementation of a new prototype Compound Evaluation System (CES). The CES was designed to provide the agency with a more systematic approach to the categorization of compounds with respect to their likelihood of occurrence in meat and poultry and their potential impact on public health. The CES was subjected to extensive external review by the tri-agency advisory board cited above (Surveillance Advisory Team) and was published. Briefly, the CES addresses the risk of residues in meat and poultry as a function of two major elements: hazard (adverse effects that may be produced by a given compound) and exposure (residue concentration; factors affecting concentration, such as use patterns, withdrawal times, etc.; duration of or frequency of consumption of product containing residues of concern). The proposed system is a two-value, hierarchical compound-ranking scheme that classifies a given pesticide, animal drug, or contaminant in any one of 24 categories. Compounds of greatest concern carry a designation of A-1 (high health hazard potential; high likelihood of residue occurrence); those compounds of least concern are designated D-4 (negligible health hazard potential; negligible likelihood of residue occurrence). The letter Z is used to indicate an element of the two-value system lacking the information needed for classification. Care is taken to avoid the use of exact numerical rankings that might suggest a high degree of sophistication possibly not justifiable because of data limitations or the assumptions inherent in the ranking process.

The assignment of a specific ranking is based on a review of information entered in a comprehensive set of CES worksheets prepared for each compound evaluated. These worksheets provide a permanent record and chronology of the nature and extent of the technical and scientific data that were considered. Certain compounds considered within the FSIS National Residue Program have been evaluated using the CES. It should be understood that the rankings are based strictly on data available to FSIS at the time and may well change as additional information becomes available in the open literature, from other agencies, or from the private sector. To further advance the CES effort, FSIS is using outside assistance in the preparation of a series of compound evaluation reports that will provide the basic information necessary to prepare the CES worksheets. To this end, a contract was awarded that calls for the preparation of evaluative reports on 50 compounds of potential concern to the agency. This work is now under way.

CRITERIA FOR COMPOUND EVALUATION AND RANKING

FSIS believes that the Compound Evaluation System is sufficiently flexible to permit rapid response to new information that may affect previous rankings and to allow for the use of scientific or expert judgement. It must be emphasized, however, that the CES was neither designed nor intended for use in the development of formal quantitative estimates of risk from meatborne residues. Rather, it provides a rational basis for changes in compound emphasis within the National Residue Program and encourages development of analytical methods for important compounds for which no methods exist. As such, the CES serves as a useful guide in the planning and allocation of FSIS Program resources for those residues considered to represent the greatest potential effect on public health. The CES is updated as appropriate to provide the FSIS with a constant, informative, and sound approach to dealing with residues in meat and poultry. The compounds in the List of Compounds Considered that have been assigned values in the new system are listed separately at the end of Section 1.B.

FSIS welcomes comments or suggestions regarding the CES; a copy of the CES document is available upon request. Send comments or requests regarding the CES to:

*USDA, FSIS, Science and Technology
Director, Residue Evaluation and Planning Division
300 12th St., S.W., Washington, D.C. 20250*

LIST OF COMPOUNDS CONSIDERED

System of Compound Listing and Counting

In an eclectic document such as this, rules must be applied for uniformity in listing different forms of the chemical (e.g., salts, esters, isomers) and significant metabolites. We applied the following criteria for uniformity in our listings.

CFR reference names, when available, are used for the primary entries; exceptions are footnoted. (Note: In the original edition of this document, some common and trade names were used in the tolerance section. This inconsistency was sometimes confusing; CFR names are now used in both the List of Compounds Considered and the Residue Limits section. All names thus affected have been included in the cross-reference section.)

Isomers of a compound--compounds having the same percentage composition and molecular weight but differing in chemical or physical properties--are not listed separately.

Different salts, esters, etc. are listed separately if the use conditions of these substances appear in different CFR citations. For example, penicillin and penicillin G are listed as two compounds. The various forms of penicillin G--free acid, benzathine, sodium salt, and procaine salts--are shown in the listing under penicillin G but are not counted individually.

Metabolites are listed separately only when the tolerance citation refers to a specific metabolite, or when a suitable regulatory method is available for the metabolite.

Complex mixtures such as PCB's are listed as a single entry.

LIST OF COMPOUNDS CONSIDERED

Compound	Reference	Listed in 1979 GAO Report	Ranking
Acephate	40 CFR 180.108	yes	B-4
Acepromazine	21 CFR 520.23 21 CFR 522.23	no	D
2-Acetylamino-5-nitrothiazole	21 CFR 556.20	yes	D
Aflatoxin	none	no	A-4
Aklomide	21 CFR 556.30 21 CFR 558.35	yes	C
Alachlor	40 CFR 180.249	no	A-2
Albendazole	21 CFR 556.34 21 CFR 520.45	no	A-2
Aldicarb	40 CFR 180.269	yes	A-4
Aldrin	none ¹	yes	A-3
[1 Alpha-(s), 3 alpha (Z)]-(±)-cyano-(3-phenoxy-phenyl)methyl 3-(2-chloro-3,3,3-trifluoro-1-propenyl)-2,2-dimethylcyclopropane-carboxylate	40 CFR 180.438	no	D
(Alpha RS,2R)-fluvalinate [(RS)-alpha-cyano-3-phenoxybenzyl (R)-2-[2-chloro-4-(trifluoromethyl)anilino-3-methylbutanoate	40 CFR 180.427	no	D
Aluminum tris (o-ethylphosphonate)	40 CFR 180.415	no	D
Ametryn	40 CFR 180.258	no	A
4-Amino-2-chloro-benzamide (aklomite metabolite)	21 CFR 556.30 21 CFR 558.35	no	C

¹ Tolerances revoked December 24, 1986.

LIST OF COMPOUNDS CONSIDERED

Compound	Reference	Listed in 1979 GAO Report	Ranking
4-Amino-6-(1,1-dimethylethyl)-3-methylthio-1,2,4-triazin-5(4H)-one	40 CFR 180.332	yes ¹	D
2-Amino-N-isopropyl benzamide (bentazon metabolite)	40 CFR 180.355	no	D
Aminomethyl phosphonic acid (glyphosate metabolite)	40 CFR 180.364	no	D
2-Amino-6-methylpyrimidin-4-ol (irimiphos-methyl metabolite)	40 CFR 180.409	no	D
3-Amino-5-nitro-o toluamide (zoalene metabolite)	21 CFR 556.770	no	B
4-Amino-alpha-[(tert-butyl-amino)methyl]-3,5-dichlorobenzyl alcohol	none	no	B-4
Amitraz	40 CFR 180.287	no	B-3
Ammoniates of [ethylene-bis(dithiocarbamate)] zinc and ethylenebis [dithiocarbamic acid]bimolecular and trimolecular cyclic anhydrosulfides and disulfides	40 CFR 180.217	yes ²	D
Amoxicillin trihydrate	21 CFR 556.38 21 CFR 540.103	no	B
Ampicillin	21 CFR 556.40 21 CFR 540.105	yes	B-2
Ampicillin trihydrate	21 CFR 556.40 21 CFR 540.107	yes	B-2
Amprolium	21 CFR 556.50 21 CFR 520.100 21 CFR 558.55	yes	A

1 As Sencor

2 As Polyram

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1.B.3

LIST OF COMPOUNDS CONSIDERED

Compound	Reference	Listed in 1979 GAO Report	Ranking
Apramycin	21 CFR 556.52 21 CFR 520.110	no	D
Arsanilate sodium	21 CFR 556.60 21 CFR 558.60	no	A
Arsanilic acid	21 CFR 556.60 21 CFR 558.62	no	C-1
Arsenate, Calcium	40 CFR 180.192	no	C
Arsenate, Copper	none ¹	no	D
Arsenate, Lead	40 CFR 180.194	no	D
Arsenate, Magnesium	none ¹	no	D
Arsenate, Sodium	none ¹	no	D
Arsenic	21 CFR 556.60	yes	A
Arsenite, Potassium	none ¹	no	D
Arsenite, Sodium	40 CFR 180.335	no	D
Atrazine	40 CFR 180.220	yes	C-3
Avermectin	53 FR 22383	no	D
Azaperone	21 CFR 522.150	no	B-4
Bacitracin methylene disalicylate	21 CFR 556.70 21 CFR 548.112 21 CFR 558.76	yes	C
Bacitracin zinc	21 CFR 556.70 21 CFR 548.114 21 CFR 558.78	yes	C
Bambermycins ²	21 CFR 558.95	no	D
Bendiocarb	none	yes ³	D

1 Tolerances revoked May 4, 1988.

2 Common name, flavomycin.

3 As Ficam.

LIST OF COMPOUNDS CONSIDERED

Compound	Reference	Listed in 1979 GAO Report	Ranking
Benomyl	40 CFR 180.294	yes	B-3
Bentazon	40 CFR 180.355	no	D
BHC	none ¹	yes ²	B-2
Bifenthrin	none	no	D
3,6-Bis (2-chloro-phenyl)-1,2,4,5-tetrazine	none	no	D
Bismuth subsalicylate	NADA 010-158	no	D
Bromoxynil	40 CFR 180.324	no	D
Bufencarb	40 CFR 180.255	no	D
Buquinolate	21 CFR 556.90 21 CFR 558.105	yes	D
sec-Butylamine	21 CFR 561.60 40 CFR 180.321	yes	D
3-tert-Butyl-5-chloro-6-hydroxy-methyluracil (terbacil metabolite)	40 CFR 180.209	no	D
2-tert-Butyl-4-(2,4-dichloro-5-hydroxy-phenyl)delta ² 1,3,4-oxadiazolin-5-one (oxadiazon metabolite)	40 CFR 180.346	no	D
Butyl 2[4-[[5-(trifluoromethyl)-2-pyridinyl]oxy]phenoxy] propionate (butyl ester of fluazifop)	40 CFR 180.411	no	D
Cacodylic acid	40 CFR 180.311	no	D

1 Tolerances revoked July 16, 1986.

2 As benzene hexachloride.

LIST OF COMPOUNDS CONSIDERED

Compound	Reference	Listed in 1979 GAO Report	Ranking
Cadmium	none	no	B-4
Calcium	none	no	D
Cambendazole	21 CFR 520.300	no	B
Captafol	40 CFR 180.267	no	D
Captan	40 CFR 180.103	yes	B-3
Carbadox	21 CFR 556.100 21 CFR 558.115	yes	A-3
Carbarsone	21 CFR 556.60 21 CFR 558.120	no	C-2
Carbaryl	40 CFR 180.169	yes	B-2
Carbofuran	40 CFR 180.254	yes	C-3
Carbomycin	21 CFR 556.110 21 CFR 520.1660a	yes	D
Carbophenothion	40 CFR 180.156	yes	D
Carboxin	40 CFR 180.301	no	C-4
3-Carboxy-5-ethoxy- 1,2,4-thiadiazole (5- ethoxy-3-(trichloromethyl 1,2,4-thiadiazole) metabolite)	40 CFR 180.370	no	D
2-Carboxyisopro- pyl-4-(4-dichloro)- 5-isopropoxyphenyl) delta ² 1,3,4-oxadiazol- in-5-one (oxadiazon metabolite)	40 CFR 180.346	no	D
Ceftiofur	21 CFR 556.113 21 CFR 522.313	no	D
Cephapirin benzathine	21 CFR 556.115 21 CFR 526.363	yes	D
Cephapirin sodium	21 CFR 556.115 21 CFR 529.365	yes	D

LIST OF COMPOUNDS CONSIDERED

Compound	Reference	Listed in 1979 GAO Report	Ranking
Chloral hydrate	21 CFR 522.380	no	D
Chloramphenicol	21 CFR 555	no	A-2
Chloramphenicol palmitate	21 CFR 555.111	no	A-2
Chlorbromuron	none ¹	no	D
Chlordane (technical) ²	none ³	yes	A-2
Chlordecone	none	no	D
Chlordimeform	40 CFR 180.285	yes	D
Chlorhexidine dihydrochloride	21 CFR 556.120 21 CFR 524.402 21 CFR 529.400	yes	C
Chlormadinone acetate	none ⁴	yes	D
4-Chloro-5-amino- 2-(a,a,a-trifluoro- m-tolyl)-3(2H)- pyridazinone (norflura- zon metabolite)	40 CFR 180.356	no	D
Chlorobutanol	21 CFR 556.140	no	D
2-Chloro-N,N-dial- lylacetamide	40 CFR 180.282	yes	C
2-Chloro-1-(2,4- dichlorophenyl) vinyl diethyl phosphate	40 CFR 180.322	no	D
6-Chloro-2,3-dihydro- 7-hydroxymethyl-3,3- dimethyl-5H-oxazolo (3,2-a)pyrimidin-5-one (terbacil metabolite)	40 CFR 180.209	no	D

1 Tolerances revoked May 4, 1988.

2 Residues of metabolized technical chlordane are reported as the sum of the isomers of chlordane, oxyclordane, and nonachlor.

3 Tolerances revoked December 24, 1986.

4 Tolerances withdrawn in June, 1982.

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1.B.7

LIST OF COMPOUNDS CONSIDERED

Compound	Reference	Listed in 1979 GAO Report	Ranking
6-Chloro-2,3-dihydro-3,3,7-trimethyl-5H-oxazolo(3,2-a)pyrimidin-5-one (terbacil metabolite)	40 CFR 180.209	no	D
2-Chloro-N-isopropylacetanilide	40 CFR 180.211	yes ¹	D
2-Chloro-4-[1,1-dimethylethyl] phenol (crufomate metabolite)	40 CFR 180.295	no	B
Chloroneb	40 CFR 180.257	no	D
1-(4-Chlorophenoxy)-3,3-dimethyl-1-(1H-1,2,4-triazol-1-yl)-2-butanone	40 CFR 180.410	no	D
beta-(4-Chlorophenoxy)-alpha-(1,1-dimethylethyl)-1H-1,2,4-triazole-1-ethanol (1-(4-chlorophenoxy)-3,3-dimethyl-1-(1H-1,2,4-triazol-1-yl)-2-butanone metabolite)	40 CFR 180.410	no	D
2-(m-Chlorophenoxy) propionic acid	40 CFR 180.325	no	D
S-(2-Chloro-1-phthalimidoethyl) O,O-diethyl phosphorothioate (oxygen analog of dialifor)	40 CFR 180.326	no	D
6-Chloropicolinic acid (nitrapyrin metabolite)	40 CFR 180.350	no	C
Chlorothalonil	40 CFR 180.275	no	D
Chlorothiazide	21 CFR 520.420	no	D
2-Chloro-1-(2,4,5-trichlorophenyl)-vinyl dimethyl phosphate	40 CFR 180.252	yes ²	A

¹ As propachlor.

² As Gardona.

January, 1990

1.B.8

LIST OF COMPOUNDS CONSIDERED

Compound	Reference	Listed in 1979 GAO Report	Ranking
5-[2-Chloro-4-(tri-fluoromethyl)-phen-oxy]-2-nitrobenzoic acid (acifluorfen sodium salt metabolite)	40 CFR 180.383	no	D
Chlorpyrifos	40 CFR 180.342	yes	B-4
Chlorpyrifos-methyl and metabolite	40 CFR 180.419	no	D
Chlorsulfuron	40 CFR 180.405	no	D
Chlortetracycline bisulfate	21 CFR 556.150 21 CFR 558.128 21 CFR 546.113	yes	A
Chlortetracycline hydrochloride	21 CFR 556.150 21 CFR 558.128 21 CFR 546.110	yes	A
Chorionic gonadotrophin	21 CFR 522.1081	no	D
Clofentezine	53 FR 16780	no	D
Clopidol	21 CFR 556.160 21 CFR 558.175	yes	C
Cloprostenol sodium	21 CFR 522.460	no	B-4
Clopyralid	40 CFR 180.431	no	D
Clorsulon	21 CFR 556.163 21 CFR 520.462	no	D
Cloxacillin, Benzathine	21 CFR 556.165 21 CFR 540.814	yes	B
Cloxacillin, Sodium	21 CFR 556.165 21 CFR 540.815	yes	B
Cobalt	none	no	D
Copper	none	no	D
Copper glycinate	NADA 031-971	no	D

LIST OF COMPOUNDS CONSIDERED

Compound	Reference	Listed in 1979 GAO Report	Ranking
Copper naphthenate	NADA 012-991	no	D
Corticotropin	NADA 008-760	no	D
Coumaphos and oxygen analog	40 CFR 180.189 21 CFR 558.185 21 CFR 520.500	yes	B-2
Cresylic acid	none	no	D
Crufomate	40 CFR 180.295	yes	B
Cyanide salts	none	no	D
Cyano (3-phenoxyphenyl) methyl-4-chloro-a-(methyl- ethyl) benzeneacetate	40 CFR 180.379	no	D-3
Cyfluthrin	40 CFR 180.436	no	D
Cyhexatin	40 CFR 180.144	yes ¹	D
Cypermethrin	40 CFR 180.418	no	B-3
Cyromazine ² and metabolite	40 CFR 180.414	no	B-3
2,4-D (technical)	40 CFR 180.142	yes	B-2
Dalapon	40 CFR 180.150	yes	A-3
Daminozide	40 CFR 180.246	yes	B-3
DDE (DDT metabolite)	none ³	no	A
DDT	none ³	yes	B-3
Decoquate	21 CFR 556.170 21 CFR 558.195	yes	Z-4
Deltamethrin	none	no	C-4
Demeton	40 CFR 180.105	yes	D

1 As Plictran.

2 Trade name, Larvadex.

3 Tolerances revoked December 24, 1986.

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1.B.10

LIST OF COMPOUNDS CONSIDERED

Compound	Reference	Listed in 1979 GAO Report	Ranking
Dexamethasone	21 CFR 520.540	no	C
Dialifor and oxygen analog	40 CFR 180.326	yes	D
Diazinon	40 CFR 180.153	yes	D
1,1-Dichloro-2,2-bis (p-ethylphenyl)ethane	40 CFR 180.139	yes ¹	D
Dibromochloropropane	none	no	D
Dibutyltin dilaurate	NADA 008-741 21 CFR 558.20	no	A-1
Dicamba	40 CFR 180.227	no	C
3,5-Dichloro-N- (1,1-dimethyl-2- propynyl) benzamide	40 CFR 180.317	no	C
3-(2,2-Dichloro- ethenyl)-2,2-dimethyl- cyclopropane carboxylic acid (permethrin metabolite)	40 CFR 180.378	no	D
3, 6-Dichloro-5- hydroxy-o-anisic acid (dicamba metabolite)	40 CFR 180.227	no	C
2,5-Dichloro-4- methoxyphenol (cloroneb metabolite)	40 CFR 180.257	no	D
2,4-Dichlorophenol (2,4-D metabolite) ²	40 CFR 180.142	no	B
2,4-Dichlorophenoxy- acetic acid [4-(2,4- dichlorophenoxy) butyric acid metabolite]	40 CFR 180.331	no	D
4-(2,4-Dichloro- phenoxy butyric acid	40 CFR 180.331	no	D

¹ As Perthane.

² Common name 2, 4-DCP.

LIST OF COMPOUNDS CONSIDERED

Compound	Reference	Listed in 1979 GAO Report	Ranking
1-(2,4-Dichlorophenyl)- 2-(1H-imidazole-1-yl)-1- ethanol (imazalil metabolite)	40 CFR 180.413	no	D
3-(1-(2,4-Dichlorophenyl)- 2-(1H-imidazole-1-yl)- ethoxyl)-1,2-propanediol (imazalil metabolite)	40 CFR 180.413	no	D
2,4-Dichlorophenyl p-nitrophenyl ether ¹	none ²	no	D
1-[[2-(2,4-Dichloro- phenyl)-4-propyl-1,3- dioxolan-2-yl]methyl]-1- H-1,2,4-triazole and metabolites	40 CFR 180.434	no	D
2,2-Dichlorovinyl dimethyl phosphate (naled metabolite)	40 CFR 180.215	no	B
Dichlorvos	21 CFR 556.180 21 CFR 520.600 21 CFR 558.205 40 CFR 180.235 ³	yes	B-4
Diclofop-methyl	40 CFR 180.385	no	D
Dieldrin	none ⁴	yes	A
S-[[[(Diethoxyphosphino- thioyl)thio]-methyl] O,O- diethyl phosphorothioate (oxygen analog of ethion)	40 CFR 180.173	no	B
2-Diethylamino-6- methyl-pyrimidin-4- ol (pirimiphos-methyl metabolite)	40 CFR 180.409	no	D

¹ Common name nitrofen.

² Tolerances revoked September 18, 1985.

³ As 2,2-dichlorovinyl dimethyl phosphate.

⁴ Tolerances revoked December 24, 1986.

LIST OF COMPOUNDS CONSIDERED

Compound	Reference	Listed in 1979 GAO Report	Ranking
O,O-Diethyl O-3-chloro-4-methyl-2-oxo (2H)-1-benzopyran-7-yl phosphate (oxygen analog of coumaphos)	40 CFR 180.189	no	A
O,O-Diethyl S-[2-(ethylthio)ethyl] phosphorodithioate	40 CFR 180.183	yes ¹	A-2
O,O-Diethyl-O-[p-(methylsulfinyl) phenyl] phosphorothioate	40 CFR 180.234	no	B
Diethylstilbestrol	none	yes	D
Difenzoquat	40 CFR 180.369	no	D
Diflubenzuron	40 CFR 180.377	no	D
5,6-Dihydro-3-carbox-anilide-2-methyl-1,4-oxathiin-4-oxide (carboxin metabolite)	40 CFR 180.301	no	D
5,6-Dihydrodihydroxycarbaryl (carbaryl metabolite)	40 CFR 180.169	no	D
5,6-Dihydrodihydroxynaphthol (carbaryl metabolite)	40 CFR 180.169	no	D
2,3-Dihydro-2,2-dimethyl-3,7-benzofurandiol (carbofuran metabolite)	40 CFR 180.254	no	C
2,3-Dihydro-2,2-dimethyl-7-benzofuranol (carbofuran metabolite)	40 CFR 180.254	no	C
2,3-Dihydro-2,2-dimethyl-3-hydroxy-7-benzofuranyl-N-methylcarbamate (carbofuran metabolite)	40 CFR 180.254	no	C

¹ As Disyston, common name disulfoton.

LIST OF COMPOUNDS CONSIDERED

Compound	Reference	Listed in 1979 GAO Report	Ranking
2,3-Dihydro-2,2-dimethyl-3-oxo-7-benzofuranol (carbofuran metabolite)	40 CFR 180.254	no	C
2,3-Dihydro-3,3-dimethyl-2-oxo-5-benzofuranyl methanesulfonate (ethofumesate metabolite)	40 CFR 180.345	no	D
Dihydrostreptomycin	21 CFR 556.200 21 CFR 540.874d, e 21 CFR 544.173/275	yes	A-1
Dimethipin	40 CFR 180.406	no	D
Dimethoate and oxygen analog	40 CFR 180.204	yes	B-3
(O,O-Dimethyl O-p-(dimethylsulfamoyl)phenyl phosphate) (oxygen analog of O,O-dimethyl O-p-(dimethylsulfamoyl)phenyl phosphorothioate)	40 CFR 180.233	no	B
O,O-Dimethyl O-p-(dimethylsulfamoyl)phenyl phosphorothioate	21 CFR 524.900 ¹ 21 CFR 558.254 ¹ 40 CFR 180.233	no	B
O,O-Dimethyl S-(N-methylcarbamoylmethyl)phosphorothioate (oxygen analog of dimethoate)	40 CFR 180.204	no	D
3,5-Dimethyl-4-(methylsulfinyl)phenyl methyl carbamate (3,5-dimethyl-4-(methylthio)phenyl methylcarbamate metabolite)	40 CFR 180.320	no	D
3,5-Dimethyl-4-(methylthio)phenyl methylcarbamate	40 CFR 180.320	no	D

¹ As famphur.

LIST OF COMPOUNDS CONSIDERED

Compound	Reference	Listed in 1979 GAO Report	Ranking
O,O-Dimethyl S-[(4-oxo-1,2,3-benzotriazin-3(4H)-yl)methyl]phosphorodithioate	40 CFR 180.154	yes ¹	D
Dimethyl-4,4'-o-phenylene bis(allophanate) (oxygen analog of thiophanate-methyl)	40 CFR 180.371	no	D
N-[2,4-dimethyl-phenyl-N-methyl formamide] (amitraz metabolite)	40 CFR 180.287	no	D
N-[2,4-dimethyl-N-methylmethanimidamide] (amitraz metabolite)	40 CFR 180.287	no	D
N,N-Dimethylpiperidinium chloride	40 CFR 180.384	no	D
Dimethyl phosphate of a-methylbenzyl 3-hydroxy-cis-crotonate	40 CFR 180.280	no	D
O,S-Dimethyl phosphoramidothioate (acephate metabolite)	40 CFR 180.108	no	D
Dimethyl sulfoxide	21 CFR 524.660 40 CFR 180.1001	no	A-4
Dimetridazole	none ²	yes	C
3,5-Dinitrobenzamide	21 CFR 556.220 21 CFR 558.376 ³	yes	D
Dinoprost tromethamine	21 CFR 522.690	no	B-4
Dinoseb	40 CFR 180.281	no	C
Dioxathion	40 CFR 180.171	yes	D
Diphenylamine	40 CFR 180.190	yes	B-4

¹ As azinphosmethyl and as Guthion.

² Tolerances and approvals for use withdrawn July 6, 1987.

³ As nitromide.

LIST OF COMPOUNDS CONSIDERED

Compound	Reference	Listed in 1979 GAO Report	Ranking
Dipropyl iso-cinchomeronate	40 CFR 180.143	no	A
Diquat	40 CFR 180.226	no	D
Diuron	40 CFR 180.106	yes	A
Dodecachloroocta-hydro-1,3,4-metheno-2H-cyclobuta[cd]pentalene	none ¹	yes ²	A
Dodine	40 CFR 180.172	yes	D
Endosulfan	40 CFR 180.182	yes	D
Endosulfan sulfate (endosulfan metabolite)	40 CFR 180.182	no	D
Endrin	40 CFR 180.131	yes	A-3
Erythromycin	21 CFR 556.230 21 CFR 526.820	yes	A
Erythromycin phosphate	21 CFR 556.230 21 CFR 520.823	yes	A
Erythromycin thiocyanate	21 CFR 556.230 21 CFR 558.248	yes	A
Estradiol	21 CFR 522.840	yes	A
Estradiol benzoate	21 CFR 556.240 21 CFR 522.842/1940	yes	A
Estradiol monopalmitate	none ³	yes	A
Estradiol valerate	21 CFR 522.850	yes	A
Ethalfuralin	40 CFR 180.416	no	D
Ethephon	40 CFR 180.300	no	D
Ethion and oxygen analog	40 CFR 180.173	yes	B

1 Tolerances revoked December 17, 1986.

2 As mirex.

3 Approvals for use withdrawn May 4, 1988.

January, 1990

1.B.16

LIST OF COMPOUNDS CONSIDERED

Compound	Reference	Listed in 1979 GAO Report	Ranking
Ethofumesate	40 CFR 180.345	no	D
Ethopabate	21 CFR 556.260 21 CFR 558.58	yes	B
2-[1-(Ethoxyimino) butyl]-5-[2-(ethylthio) propyl]-3-hydroxy-2- cyclohexene-1-one	40 CFR 180.412	no	D
Ethoxyquin	21CFR 172.140	no	D
5-Ethoxy-3-(trichloro- methyl)-1,2,4-thiadiazole	40 CFR 180.370	no	D
2-Ethylamino-6-methyl- pyrimidin-4-ol (pirimiphos- methyl metabolite)	40 CFR 180.409	no	D
O-(2-Ethylamino-6- methyl-pyrimidin-4-yl) O,O-dimethyl phosphoro- thioate (pirimiphos- methyl metabolite)	40 CFR 180.409	no	D
Ethyl 4,4'-dichlorobenzi- late (chlorobenzilate)	40 CFR 180.109	yes ¹	D
Ethylene dibromide	40 CFR 180.126 ² 40 CFR 180.397	no	A-4
Ethyl 3-methyl-4- (methylsulfinyl) phenyl (1-methylethyl) phos- phoramidate (ethyl 3- methyl-4-(methylthio) phenyl (1-methylethyl) phosphoramidate metabolite)	40 CFR 180.349	no	D
Ethyl 3-methyl-4- (methylsulfonyl) phenyl (1-methylethyl) phosphoramidate (ethyl 3-methyl-4- (methylthio) phenyl (1-methylethyl) phosphoramidate metabolite)	40 CFR 180.349	no	D

¹ As chlorobenzilate.

² No tolerances have been established for residues in meat and poultry.

LIST OF COMPOUNDS CONSIDERED

Compound	Reference	Listed in 1979 GAO Report	Ranking
Ethyl 3-methyl-4-(methylthio) phenyl phosphoramidate (ethyl 3-methyl-4-(methylthio) phenyl (1-methylethyl) phosphoramidate metabolite)	40 CFR 180.349	no	D
Ethyl 3-methyl-4-(methylthio)phenyl (1-methylethyl) phosphoramidate	40 CFR 180.349	no	D
2-[(2-Ethyl-6-methyl-phenyl)amino]-1-propanol (metolachlor metabolite)	40 CFR 180.368	no	D
4-(2-Ethyl-6-methyl-phenyl)-2-hydroxy-5-methyl-3-morpholinone (metolachlor metabolite)	40 CFR 180.368	no	D
Ethyl 4-(methylsulfinyl) phenyl phosphoramidate (ethyl 3-methyl-4-(methylthio) phenyl (1-methylethyl) phosphoramidate metabolite)	40 CFR 180.349	no	D
Ethyl 4-(methylsulfonyl)phenyl phosphoramidate (ethyl 3-methyl-4-(methylthio) phenyl (1-methylethyl) phosphoramidate metabolite)	40 CFR 180.349	no	D
O-Ethyl-O-[4-(methylthio) phenyl] S-propyl phosphorodithioate	40 CFR 180.374	no	D
O-Ethyl S-phenyl ethylphosphonodithioate ¹	40 CFR 180.221	no	D
S-[2-(Ethylsulfinyl) ethyl] O,O-dimethylphosphorothioate	40 CFR 180.330	no	D

¹ Common name fonofos.

LIST OF COMPOUNDS CONSIDERED

Compound	Reference	Listed in 1979 GAO Report	Ranking
Fenarimol	40 CFR 180.421	no	D
Fenbendazole	21 CFR 556.275 21 CFR 520.905 21 CFR 558.258	no	B-3
Fenitrothion	none	no	D
Fenprostalene	21 CFR 556.277 21 CFR 522.914	no	D
Fenridazon, potassium salt	40 CFR 180.423	no	D
Fenthion	40 CFR 180.214 21 CFR 524.920	yes	C-3
Florogestrone acetate	NADA 034-601	no	D
Fluazifop and butyl ester	40 CFR 180.411	no	D
Flucythrinate	40 CFR 180.400	no	D
Flumethasone	21 CFR 520.960 21 CFR 522.960 21 CFR 524.960	no	D
Fluprednisolone	NADA 012-555	no	D
Fluprednisolone acetate	NADA 011-789	no	D
Fluridone	40 CFR 180.420	no	D
Fluzilazol	53 FR 34513	no	D
Folic acid	NADA 013-029	no	D
Follicle stimulating hormone	NADA 009-505 21 CFR 522.1822	no	D
Folpet	40 CFR 180.191	no	D
Furaltadone	none	no	B
Furazolidone	21 CFR 556.290 21 CFR 524.1005 21 CFR 558.262	yes	A-1

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1.B.19

LIST OF COMPOUNDS CONSIDERED

Compound	Reference	Listed in 1979 GAO Report	Ranking
Furosemide	21 CFR 522.1010	no	D
Gasoline	none	no	D
Gentamicin sulfate	21 CFR 556.300 21 CFR 520.1044 21 CFR 522.1044 21 CFR 524.1044 21 CFR 529.1044	yes	B-2
Gentian violet	none	yes	D
Glyphosate	40 CFR 180.364	no	D
Halofuginone	21 CFR 556.308 21 CFR 558.265	no	A-1
Haloxon	21 CFR 556.310 21 CFR 520.1120	yes	C
HCB	none	no	A-3
Heptachlor and heptachlor epoxide (oxidation product of heptachlor)	40 CFR 180.104	yes	A-1
Hetacillin, Potassium	21 CFR 540.829	no	B
Hexakis (2-methyl-2- phenylpropyl) distannoxane	40 CFR 180.362	yes ¹	C
Hexazinone	40 CFR 180.396	no	D-4
Hexetidine	NADA 013-772	no	D
Hydrochlorothiazide	21 CFR 522.1150	no	D
Hydrocortisone acetate	21 CFR 556.320 21 CFR 524.1484d,h,i	no	C
3-Hydroxycarbofuran (carbofuran metabolite)	40 CFR 180.254	no	D

¹ As "hexakis."

LIST OF COMPOUNDS CONSIDERED

Compound	Reference	Listed in 1979 GAO Report	Ranking
2-Hydroxy-2,3-di- hydro-3,3-dimethyl-5-benzo- furanyl methanesulfonate (ethofumesate metabolite)	40 CFR 180.345	no	D
5-[1-hydroxy-2-(isopropyl- amino)ethyl]	none	no	D
N-(2-Hydroxymethyl- 6-methyl)-N-(methoxy- acetyl)-alanine methyl ester (metaxyl metabolite)	40 CFR 180.408	no	D
5-Hydroxythia- bendazole (thiabendazole metabolite)	21 CFR 556.730 40 CFR 180.242 21 CFR 558.615	no	A
Hygromycin B	21 CFR 556.330 21 CFR 558.274	yes	A-Z
Imazalil	40 CFR 180.413	no	D
Iprodione	40 CFR 180.399	no	D
Ipronidazole	none ¹	yes	Z-4
Ipronidazole hydrochloride	none ¹	no	Z-4
Iron	none	no	D
Isopropyl carbanilate (IPC)	40 CFR 180.319	no	D
Isopropyl m-chlorocar- banilate (CIPC)	40 CFR 180.319	no	D
Ivermectin	21 CFR 556.344 21 CFR 520.1192, 3, 4, 5 21 CFR 522.1192	no	B-1
Lasalocid	21 CFR 556.347 21 CFR 558.311	no	B
Lead	none	no	B-4
Levamisole	21 CFR 524.1240	no	D

¹ Tolerances and approvals for use revoked January 17, 1989.

LIST OF COMPOUNDS CONSIDERED

Compound	Reference	Listed in 1979 GAO Report	Ranking
Levamisole hydrochloride	21 CFR 556.350 21 CFR 558.315 21 CFR 520.1242	yes	C-2
Levamisole phosphate	21 CFR 556.350 21 CFR 522.1244	no	C-2
Lidocaine hydrochloride	21 CFR 522.1258	no	D
Lincomycin	21 CFR 556.360	yes	B
Lincomycin hydrochloride	21 CFR 520.1263 21 CFR 522.1260 21 CFR 558.325	yes	B
Lindane ¹	40 CFR 180.133	yes	A-2
Linuron	40 CFR 180.184	yes	A-3
Lysergic acid diethylamide	none	no	D
Maduramicin ammonium	21 CFR 556.375 21 CFR 558.340	no	D
Malathion	40 CFR 180.111	yes	B
Maneb	40 CFR 180.110	yes	D
Manganese	21 CFR 582.5446	no	D
Mebendazole	21 CFR 520.1320 21 CFR 520.1326	no	B-4
Mefluidide	40 CFR 180.386	no	D
Melamine (cyromazine metabolite)	40 CFR 180.414	no	D
Melengestrol acetate	21 CFR 556.380 21 CFR 558.342	yes	B-4
N-(Mercaptomethyl) phthalimide S-(O,O-dimethylphos- phorodithioate)	40 CFR 180.261 21 CFR 524.1742	no	D

¹ The gamma isomer of BHC.

LIST OF COMPOUNDS CONSIDERED

Compound	Reference	Listed in 1979 GAO Report	Ranking
N-(Mercaptomethyl) phthalimide S-(O,O-dimethyl phosphorothioate) (oxygen analog of N-(mercaptomethyl) phthalimide S-(O,O-dimethyl phosphorodithioate))	40 CFR 180.261 21 CFR 524.1742	no	D
Mercury	none	no	D
Metalaxyl	40 CFR 180.408	no	D
Methamidophos¹	40 CFR 180.315	no	D
Methanearsonic acid	40 CFR 180.289	yes	D
Methomyl	40 CFR 180.253	no	D
Methoprene	40 CFR 180.359	yes	D
Methoxychlor	40 CFR 180.120	yes	D-4
Methyl-2-benzimidazole carbamate (MBC) (benomyl metabolite)	40 CFR 180.294	no	D
Methyl bromide	none	no	B-4
2-Methyl-4-chlorophenol (2-methyl-4-chlorophenoxy-acetic acid metabolite)	40 CFR 180.339	no	B
2-Methyl-4-chlorophenoxyacetic acid	40 CFR 180.339	no	B
Methyl-[2-chloro-4-(trifluoromethyl)-phenoxy]-2-nitrobenzoate (acifluorfen sodium salt metabolite)	40 CFR 180.383	no	D
6-Methyl-1,3-dithiolo [4,5-b]quinoxalin-2-one	40 CFR 180.338	no	D
Methylene chloride	40 CFR 180.1010	no	A-2

¹ Also listed as O,S-dimethyl phosphoramidothioate, a metabolite of acephate.

LIST OF COMPOUNDS CONSIDERED

Compound	Reference	Listed in 1979 GAO Report	Ranking
1-Methylethyl 2- ((ethoxy (1-amino)phos- phinoyl)oxy)benzoate (1-methylethyl 2-((ethoxy ((1-methylethyl)amino)phos- phinothioyl)oxy)benzoate metabolite)	40 CFR 180.387	no	D
1-Methylethyl 2- ((ethoxy(1-amino)phos- phinothioyl)oxy)benzoate (1-methylethyl 2-((ethoxy ((1-methylethyl)amino) phosphinothioyl)oxy) benzoate metabolite)	40 CFR 180.387	no	D
1-Methylethyl 2- ((ethoxy((1-methylethyl) amino)phosphinothioyl) oxy)benzoate	40 CFR 180.387	no	D
1-Methylethyl 2- ((ethoxy((1-methylethyl) amino)phosphinoyl)oxy) benzoate (1-methylethyl 2- ((ethoxy((1-methylethyl) amino)phosphinothioyl) oxy)benzoate metabolite)	40 CFR 180.387	no	D
2-Methyl 2-(methyl- sulfinyl) propional- dehyde O-(methylcarbam- oyl) oxime (aldicarb metabolite)	40 CFR 180.269	no	D
2-Methyl-2-(methyl- sulfonyl) propional- dehyde O-(methylcarbam- oyl) oxime (aldicarb metabolite)	40 CFR 180.269	no	D
1-Methyl-5-nitroimida- zole-2-isopropanol (ipronidazole metabolite)	21 CFR 556.340 21 CFR 558.305	no	B
Methyl parathion	40 CFR 180.121	yes	D
Metolachlor	40 CFR 180.368	no	D

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1.B.24

LIST OF COMPOUNDS CONSIDERED

Compound	Reference	Listed in 1979 GAO Report	Ranking
Metoserpate hydrochloride	21 CFR 556.410 21 CFR 520.1422	yes	D
Metsulfuron methyl	40 CFR 180.428	no	D
Monensin	21 CFR 556.420 21 CFR 520.1448 21 CFR 558.355	yes	B-3
Monuron	none	no	D
Monuron-TCA	none	no	D
Morantel tartrate	21 CFR 556.425 21 CFR 520.1450 21 CFR 558.360	no	D
Myclobutanil	40 CFR 180.443	no	D
Naled	40 CFR 180.215	yes	B-4
Naloxone hydrochloride	21 CFR 522.1462	no	D
1-Naphthol (carbaryl metabolite)	40 CFR 180.169	no	D
Narasin	21 CFR 556.428 21 CFR 558.363	no	D
Neomycin sulfate	21 CFR 556.430 21 CFR 522.1484 21 CFR 524.1484	yes	B-3
Neostigmine methyl sulfate	21 CFR 522.1503	no	C
Nequate	21 CFR 556.440 21 CFR 558.365	yes	D
Nicarbazin	21 CFR 556.445 21 CFR 558.366	no	C
Nickel	none	no	D
Nicotine	40 CFR 180.167a	no	D
Nifuraldezone	none	no	C

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1.B.25

LIST OF COMPOUNDS CONSIDERED

Compound	Reference	Listed in 1979 GAO Report	Ranking
Nitrapyrin	40 CFR 180.350	no	C
Nitrofurazone	21 CFR 524.1580 21 CFR 558.370	no	B-1
Nonachlor ¹	none	no	D
Norflurazon	40 CFR 180.356	no	D
Novobiocin	21 CFR 556.460 21 CFR 558.415	yes	B
Nystatin	21 CFR 556.470 21 CFR 558.430	yes	B
N-Octyl bicyclo- heptenedicarboximide	40 CFR 180.367	no	C
Oleandomycin	21 CFR 556.480 21 CFR 558.435	yes	A
Ormetoprim	21 CFR 556.490 21 CFR 558.575	yes	D
Oryzalin	40 CFR 180.304	no	D
Oxadiazon	40 CFR 180.346	no	D
Oxfendazole	21 CFR 520.1628-30	no	D
Oxyfluorfen	40 CFR 180.381	no	D
Oxytetracycline hydrochloride	21 CFR 556.500 21 CFR 558.450 21 CFR 520.1660 21 CFR 522.1660	yes	A
Oxytocin	21 CFR 522.1680	no	D
Paraquat	40 CFR 180.205	yes	A-4
Parathion	40 CFR 180.121	yes	D
PBB's (Polybrominated biphenyls)	none	no	D

¹ Reported as nonachlor only when it is not included with residues of metabolized chlordane.

LIST OF COMPOUNDS CONSIDERED

Compound	Reference	Listed in 1979 GAO Report	Ranking
PCB's (Polychlorinated biphenyls)	21 CFR 109.30	no	A-4
Pentachlorophenol (PCP)	none	yes	B-1
Penicillin, procaine and procaine G	21 CFR 556.510 21 CFR 558.460	yes	A
Penicillin G (benza- thine, free acid, sodium salt, and procaine salts)	21 CFR 556.510 21 CFR 540.874	yes	A
Permethrin	40 CFR 180.378	no	B-2
Phencyclidine	none	no	D
Phenothiazine	40 CFR 180.319 21 CFR 558.20	no	C
3-Phenoxybenzoic acid (permethrin metabolite)	40 CFR 180.378	no	D
(3-Phenoxyphenyl) methanol (permethrin metabolite)	40 CFR 180.378	no	D
o-Phenylphenol	40 CFR 180.129	no	D
Phorate	40 CFR 180.206	yes	D
Phosalone	40 CFR 180.263	yes	D
Picloram	40 CFR 180.292	no	C-4
Piperazine	21 CFR 520.1802 21 CFR 558.20	no	D
Piperonyl butoxide	40 CFR 180.127	yes	A
Pirimiphos-methyl	40 CFR 180.409	no	D
Pituitary luteinizing hormone	21 CFR 522.1820	no	D
Poloxalene	21 CFR 558.464 21 CFR 558.465	no	D

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1.B.27

LIST OF COMPOUNDS CONSIDERED

Compound	Reference	Listed in 1979 GAO Report	Ranking
Polymixin	21 CFR 544.373b	no	C
Prednisolone	21 CFR 556.520 21 CFR 522.1880-1890	no	D
Prednisone	21 CFR 556.530	no	D
Profenofos	40 CFR 180.404	no	D
Profluralin	40 CFR 180.348	no	D
Progesterone	21 CFR 556.540 21 CFR 522.1940	yes	B
Prometryn	40 CFR 180.222	no	C-3
Propanil	40 CFR 180.274	yes ¹	D
Proparacaine hydrochloride	21 CFR 524.1982	no	D
Propargite	40 CFR 180.259	yes	B
Propazine	40 CFR 180.243	no	C-4
Propiopromazine	21 CFR 520.2002 21 CFR 522.2002	no	D
Pyrantel tartrate	21 CFR 556.560 21 CFR 520.2045 21 CFR 558.485	yes	B
Pyrethrins	40 CFR 180.128	yes	D
Quinoxaline-2- carboxylic acid (carbadox metabolite)	21 CFR 556.100 21 CFR 558.115	no	B
Quizalofop (quizalofop ethyl metabolite)	40 CFR 180.441	no	D
Quizalofop ethyl	40 CFR 180.441	no	D
Quizalofop methyl (quizalofop ethyl metabolite)	40 CFR 180.441	no	D

¹ As Stam.

LIST OF COMPOUNDS CONSIDERED

Compound	Reference	Listed in 1979 GAO Report	Ranking
Reserpine	none	yes	D
Robenidine hydrochloride	21 CFR 556.580 21 CFR 558.515	yes	C
Ronnel	40 CFR 180.177 21 CFR 558.525 21 CFR 520.2080	yes	B
Roxarsone	21 CFR 556.60 21 CFR 558.530	no	C-1
Salicylic acid	21 CFR 556.590 21 CFR 529.2090	no	D
Salinomycin	21 CFR 558.550	no	D
Selenium	21 CFR 522.2100 21 CFR 573.920	no	D
Silvex	40 CFR 180.340	yes	A-3
Simazine	40 CFR 180.213	yes	C-3
Sodium 5-[2-Chloro-4- (trifluoromethyl)- phenoxy]-2-amino benzoate (acifluorfen sodium salt metabolite)	40 CFR 180.383	no	D
Sodium salt of acifluorfen	40 CFR 180.383	no	D
Sodium sulfa- chloropyrazine monohydrate	21 CFR 556.625 21 CFR 520.2184	yes	D
Spectinomycin dihydrochloride	21 CFR 556.600 21 CFR 520.2122 21 CFR 522.2120	yes	C
Streptomycin	21 CFR 556.610 21 CFR 544.110-973b 40 CFR 180.245	yes	A-3
Styrene	none	no	C-2
Sulfabromomethazine sodium	21 CFR 556.620 21 CFR 520.2170	no	C

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1.B.29

LIST OF COMPOUNDS CONSIDERED

Compound	Reference	Listed in 1979 GAO Report	Ranking
Sulfachlorpyridazine	21 CFR 556.630 21 CFR 520.2200 21 CFR 522.2200	yes	A
Sulfadiazine	21 CFR 520.2611	no	D
Sulfadimethoxine	21 CFR 556.640 21 CFR 520.2220 21 CFR 522.2220 21 CFR 558.575	yes	A
Sulfaethoxypyridazine	21 CFR 556.650 21 CFR 520.2240 21 CFR 522.2240 21 CFR 558.579	yes	A
Sulfamethazine	21 CFR 556.670 21 CFR 520.2260 21 CFR 522.2260	yes	B-1
Sulfamethoxypyridazine	21 CFR 520.2300	no	D
Sulfanitran	21 CFR 556.680 21 CFR 520.2320 21 CFR 558.376	yes	A
Sulfapyridine	none	no	D
Sulfaquinoxaline	21 CFR 520.2325 21 CFR 558.586	no	B-1
Sulfathiazole	21 CFR 556.690	yes	B-1
Sulfisoxazole	21 CFR 520.2330	no	C
Sulfomyxin	21 CFR 556.700 21 CFR 522.2340	no	B
2,4,5-T	none	yes	A-3
Taleranol (zeranol metabolite)	none	no	D
TDE (DDT metabolite)	none ¹	yes	A
TDE (or DDD)	none ¹	yes	A

¹ Tolerances revoked December 24, 1986.

LIST OF COMPOUNDS CONSIDERED

Compound	Reference	Listed in 1979 GAO Report	Ranking
Tebuthiuron	40 CFR 180.390	no	D
Terbacil	40 CFR 180.209	yes	D
Terbufos	40 CFR 180.352	no	D
Terbuthylazine	40 CFR 180.333	no	A
Terbutryn	40 CFR 180.265	no	A
Terpene polychlorinates	none	no	A
Testosterone propionate	21 CFR 556.710	yes	C
Tetracycline hydrochloride	21 CFR 556.720 21 CFR 546.180,a,h,i	yes	B-3
Tetradifon	40 CFR 180.174	yes	D
Thiabendazole	21 CFR 556.730 40 CFR 180.242 21 CFR 558.615 21 CFR 520.2380	yes	B-2
Thiamylal, Sodium	21 CFR 522.2424	no	D
Thidiazuron	40 CFR 180.403	no	D
Thiobencarb	40 CFR 180.401	no	D
Thiophanate-methyl and oxygen analog	40 CFR 180.371	no	D
Thiram	40 CFR 180.132	no	D
Tiamulin	21 CFR 556.738 21 CFR 520.2455 21 CFR 558.600	no	D-3
Toxaphene	40 CFR 180.138	yes	A-2
Trenbolone acetate	21 CFR 556.739 21 CFR 522.2476	no	D
Triamcinolone acetonide	21 CFR 520.2482	no	C
Triasulfuron	54 FR 18020	no	D

LIST OF COMPOUNDS CONSIDERED

Compound	Reference	Listed in 1979 GAO Report	Ranking
S,S,S-Tributyl phosphorotrithioate	40 CFR 180.272	yes ¹	D
Trichlorfon	40 CFR 180.198 ² 21 CFR 520.1326/2520	yes	B-3
3,5,6-Trichloro-2-pyridinol (chlorpyrifos metabolite)	40 CFR 180.342	no	B
3,5,6-Trichloro-2-pyridinol (chlorpyrifos-methyl metabolite)	40 CFR 180.419	no	B
3,5,6-Trichloro-2-pyridinol (triclopyrifos metabolite)	40 CFR 180.417	no	B
Triclopyr and metabolite	40 CFR 180.417	no	D
Trifluralin	40 CFR 180.207	no	C-4
Triphenyltin hydroxide	40 CFR 180.236	no	B-4
Tylosin	21 CFR 556.740 21 CFR 520.2640 21 CFR 522.2640 21 CFR 524.2640 21 CFR 558.625	yes	D-2
Virginiamycin	21 CFR 556.750 21 CFR 558.635	yes	D-4
Xylazine	21 CFR 522.2662	no	Z-4
Zeranol	21 CFR 556.760 21 CFR 522.2680	yes	C-2
Zinc	none	no	D-4
Zinc ion and maneb, coordination product	40 CFR 180.176	yes	D
Zineb	40 CFR 180.115	yes	D
Zoalene	21 CFR 556.770	yes	B

¹ As DEF.

² As dimethyl (2,2,2-trichloro-1-hydroxyethyl)phosphonate.

LIST OF COMPOUNDS CONSIDERED

Compounds Ranked Under Compound Evaluation System (CES)

Compound	Original Ranking	CES Ranking	Year of Publication
Acephate	D	B-4	1989
Aflatoxin	D	A-4	1985
Alachlor	D	A-2	1985
Albendazole	D	A-2	1987
Aldicarb	D	A-4	1986
Aldrin	A	A-3	1986
Ametryn	A	D-4	1990
4-Amino-alpha-[(tert-butylamino) methyl]-3,5-dichlorobenzyl alcohol	--	B-4	1990
Amitraz	D	B-3	1989
Ampicillin	A	B-2	1985
Ampicillin trihydrate	A	B-2	1985
Amprolium	A	A-4	1990
Arsanilic acid	A	C-1	1987
Atrazine	A	C-3	1985
Azaperone	D	B-4	1986
Benomyl	D	B-3	1986
BHC	D	B-2	1987
Cadmium	D	B-4	1985
Captan	D	B-3	1987
Carbadox	B	A-3	1987
Carbarsone	A	C-2	1987
Carbaryl	D	B-2	1988
Carbofuran	C	C-3	1986
Carboxin	D	C-4	1987
Chloramphenicol	A	A-2	1985
Chloramphenicol palmitate	A	A-2	1985
Chlordane (technical)	A	A-2	1987
Chlorpyrifos	B	B-4	1986
Cloprostenol	-	B-4	1988
Clorsulon	D	D-4	1990
Coumaphos and oxygen analog	A	B-2	1988
Cyano(3-phenoxyphenyl) methyl-4-chloro-alpha-(methylethyl) benzeneacetate	D	D-3	1989
Cyromazine	D	B-3	1989
2, 4, D (technical)	B	B-2	1987
Dalapon	A	A-3	1985
Daminozide	D	B-3	1985
DDT	A	B-3	1989
Decoquinate	D	Z-4	1986
Deltamethrin	-	C-4	1989
Dibutyltin dilaurate	D	A-1	1988
Dichlorvos	C	B-4	1987
O,O-diethyl S-[2-(ethylthio)ethyl] phosphorodithioate	D	A-2	1988

LIST OF COMPOUNDS CONSIDERED

Compounds Ranked Under Compound Evaluation System (CES)

Compound	Original Ranking	CES Ranking	Year of Publication
Dihydrostreptomycin	D	A-1	1989
Dimethoate	D	B-3	1986
Dimethyl sulfoxide	-	A-4	1989
Dinoprost tromethamine	-	B-4	1988
Diphenylamine	D	B-4	1985
Endrin	A	A-3	1986
Ethylene dibromide	D	A-4	1986
Fenbendazole	B	B-3	1987
Fenthion	B	C-3	1985
Furazolidone	B	A-1	1987
Gentamicin sulfate	A	B-2	1986
Halofuginone	D	A-1	1989
HCB	D	A-3	1989
Heptachlor and heptachlor epoxide	A	A-1	1987
Hexazinone	D	D-4	1985
5-[1-hydroxy-2-(isopropyl-amino)ethyl]	--	D-4	1990
Hygromycin B	C	A-Z	1988
Ipronidazole	B	Z-4	1986
Ipronidazole hydrochloride	B	Z-4	1986
Ivermectin	D	B-1	1986
Lead	D	B-4	1985
Levamisole	A	C-2	1985
Levamisole hydrochloride	A	C-2	1985
Lindane	A	A-2	1986
Linuron	C	A-3	1989
Mebendazole	B	B-4	1986
Melengestrol acetate	A	B-4	1989
Methamidophos	D	B-4	1990
Methoxychlor	A	D-4	1987
Methyl bromide	D	B-4	1986
Methylene chloride	D	A-2	1986
Monensin	A	B-3	1985
Monuron	D	B-4	1990
Naled	B	B-4	1987
Neomycin sulfate	A	B-3	1986
Nicarbazin	C	B-3	1990
Paraquat	A	A-4	1986
PCB's	D	A-4	1985
Pentachlorophenol (PCP)	D	B-1	1985
Permethrin	D	B-2	1987
Picloram	B	C-4	1989
Propazine	A	C-4	1988
Prometryne	C	C-3	1985
Roxarsone	A	C-1	1987

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LIST OF COMPOUNDS CONSIDERED

Compounds Ranked Under Compound Evaluation System (CES)

Compound	Original Ranking	CES Ranking	Year of Publication
Silvex	D	A-3	1986
Simazine	A	C-3	1988
Streptomycin	A	A-3	1986
Styrene	D	C-2	1989
Sulfamethazine	A	B-1	1985
Sulfaquinoxaline	A	B-1	1987
Sulfathiazole	A	B-1	1987
2,4,5-T	D	A-3	1985
Tetracycline hydrochloride	A	B-3	1986
Thiabendazole	A	B-2	1987
Thiram	D	A-2	1990
Toxaphene	A	A-2	1985
Trenbolone acetate	D	C-4	1990
Xylazine	D	Z-4	1986
Zeranol	B	C-2	1986
Zinc	D	D-4	1985
Trichlorfon	C	B-3	1985
Trifluralin	C	C-4	1986
Triphenyltin hydroxide	D	B-4	1986
Tylosin	A	D-2	1989
Virginiamycin	B	D-4	1989

LIST OF COMPOUNDS CONSIDERED Cross-referenced Compounds

Introduction

CFR names have been used wherever possible in this seventh edition of the Compound Evaluation and Analytical Capability Document. This provides uniformity in nomenclature, but can cause difficulties in locating or identifying certain compounds that have been designated by common or trade names in other places. The cross-reference section is intended to eliminate some of these difficulties. The section includes:

Names used in the 1979 GAO Report that do not follow CFR usage

Common and trade names used in the tolerance section of the first edition

Compounds almost universally known by a common name or trade name

Compounds identified by different names in different sections of the CFR

LIST OF COMPOUNDS CONSIDERED
Cross-referenced Compounds

aldicarb sulfone	2-methyl-2-(methylsulfonyl)propionaldehyde O-(methylcarbamoyl)oxime
aldicarb sulfoxide	2-methyl-2-(methylsulfinyl)propionaldehyde O-(methylcarbamoyl)oxime
(alpha RS, 2R)-fluvalinate[(RS)-alpha-cyano-3-phenoxy-benzyl (R)-2-[2-chloro-4-(trifluoromethyl)anilino]-3-methylbutanoate]	fluvalinate
aluminum tris(O-ethylphosphonate)	fosetyl Al
4-amino-6-(1,1-dimethylethyl)-3-(methylthio)-1,2,4-triazin-5(4H)one	metribuzin, Sencor
Ammoniates of [ethylenebis(dithiocarbamate)]zinc and ethylenebis[dithiocarbamic acid] biomolecular and trimolecular cyclic anhydrosulfides and disulfides	metiram, Polyram
azinphos-methyl	O,O-dimethyl S-[(4-oxo-1,2,3-benzotriazin-3(4H)-yl)methyl]phosphorodithioate, Guthion
bambermycins	flavomycin
bendiocarb	Ficam
benzene hexachloride	BHC
BHC	benzene hexachloride
bufencarb	m-(1-methylbutyl)phenyl methylcarbamate and m-(1-ethylpropyl)phenyl methylcarbamate, mixture
4-tert-butyl-2-chlorophenol	2-chloro-4-(1,1-dimethylethyl)phenol
4-tert-butyl-2-chlorophenyl methyl methylphosphoramidate (name formerly used in 40 CFR)	crufomate, Ruelene
carbophenothion	Trithion
chlordecone	Kepone
chlorfenvinphos	2-chloro-1-(2,4-dichlorophenyl) vinyl diethyl phosphate
chlorobenzilate	ethyl 4,4'-dichlorobenzilate

**LIST OF COMPOUNDS CONSIDERED
Cross-referenced Compounds**

2-chloro-1-(2,4-dichlorophenyl) vinyl diethyl phosphate	chlorfenvinphos
2-chloro-4-(1,1-dimethylethyl)phenol	4-tert-butyl-2-chlorophenol
2-chloro-N-isopropylacetanilide	propachlor
2-chloro-1-(2,4,5-trichlorophenyl) vinyl dimethyl phosphate	Gardona, tetrachlorvinphos
chlorpropham	isopropyl m-chlorocarbamate
chlorpyrifos	Dursban
crotoxyphos	dimethyl phosphate of alpha-methylbenzyl 3-hydroxy-cis-crotonate
crufomate	4-tert-butyl-2-chlorophenyl methyl methylphosphoramidate (name formerly used in 40 CFR), Ruelene
cyano(4-fluoro-3-phenoxyphenyl)methyl 3-(2,2-dichloroethenyl)-2,2-dimethylcyclo- propanecarboxylate	cyfluthrin
cyano(3-phenoxyphenyl) methyl- 4-chloro-alpha-(methylethyl) benzeneacetate	fenvalerate
cyfluthrin	cyano(4-fluoro-3-phenoxyphenyl)methyl 3-(2,2-dichloroethenyl)-2,2-dimethylcyclo- propanecarboxylate
cyhexatin	tricyclohexyltin hydroxide, Plictran
cyromazine	Larvadex
2,4-DB	4-(2,4-dichlorophenoxy) butyric acid
DEF	S,S,S-tributyl phosphorotrithioate
Diazinon	O,O-diethyl O-(2-isopropyl-6- methyl-4-pyrimidinyl) phosphorothioate
1,1-dichloro-2,2-bis (p-ethylphenyl) ethane	Perthane
3,5-dichloro-N-(1,1-dimethyl- 2-propynyl) benzamide	pronamide, propyzamide
4-(2,4-dichlorophenoxy)butyric acid	2,4-DB

**LIST OF COMPOUNDS CONSIDERED
Cross-referenced Compounds**

2,4-dichlorophenyl p-nitro-phenyl ether	nitrofen
dichlorvos (name used in 21 CFR)	2,2-dichlorovinyl dimethyl phosphate (name used in 40 CFR) .
2,2-dichlorovinyl dimethyl phosphate (name used in 40 CFR)	dichlorvos (name used in 21 CFR)
O,O-diethyl S-[2-(ethylthio)ethyl] phosphorodithioate	disulfoton, Disyston
O,O-diethyl O-(2-isopropyl-6-methyl-4-pyrimidinyl) phosphorothioate	Diazinon
O,O-diethyl-O-[p-(methylsulfinyl)phenyl] phosphorothioate	fensulfothion
2,3-dihydro-5,6-dimethyl-1,4-dithiin-1,1,4,4-tetraoxide	dimethipin
dimethipin	2,3-dihydro-5,6-dimethyl-1,4-dithiin-1,1,4,4-tetraoxide
3,5-dimethyl-4-(methylsulfinyl)phenyl methylcarbamate	methiocarb sulfoxide
3,5-dimethyl-4-(methylthio)phenyl methylcarbamate	methiocarb
O,O-dimethyl O-p-(dimethyl-sulfamoyl) phenylphosphorothioate	famphur
O,O-dimethyl S-[(4-oxo-1,2,3-benzotriazin-3(4H)-yl)methyl] phosphorodithioate	azinphos-methyl, Guthion
dimethyl phosphate of alpha-methylbenzyl 3-hydroxy-cis-crotonate	crotoxyphos
dimethyl sulfoxide	DMSO
dimethyl (2,2,2-trichloro-1-hydroxyethyl) phosphonate (name used in 40 CFR)	trichlorfon (name used in 21 CFR)
3,5-dinitrobenzamide	nitromide
disulfoton	O,O-diethyl S-[2-(ethylthio)ethyl] phosphorodithioate

LIST OF COMPOUNDS CONSIDERED
Cross-referenced Compounds

Disyston	O,O-diethyl S-[2-(ethylthio)ethyl]phosphorodithioate
DMSO	dimethyl sulfoxide
dodecachlorooctahydro-1,3,4-metheno-2H-cyclobuta[cd]pentalene	mirex
Dursban	chlorpyrifos
5-ethoxy-3-(trichloromethyl)-1,2,4-thiadiazole	etridazole
2-[1-(ethoxyimino)butyl]-5-[2-(ethylthio)propyl]-3-hydroxy-2-cyclohexene-1-one	sethoxydim
ethyl 4,4' dichlorobenzilate	chlorobenzilate
O-ethyl-O-[4-(methylthio)phenyl] S-propyl phosphorodithioate	sulprofos
S-[2-(ethylsulfinyl)ethyl] O,O-dimethyl phosphorothioate	oxydemeton-methyl
etridazole	5-ethoxy-3-(trichloromethyl)-1,2,4-thiadiazole
famphur	O,O-dimethyl O-p-(dimethylsulfamoyl)phenyl phosphorothioate
fenbutatin oxide	hexakis (2-methyl-2-phenylpropyl) distannoxane
fenridazone-potassium salt	potassium salt of 1-(4-chlorophenyl)-1,4-dihydro-6-methyl-4-oxopyridazine-3-carboxylic acid
fensulfothion	O,O-diethyl-O-[p-(methylsulfinyl) phenyl] phosphorothioate
fenvalerate	cyano(3-phenoxyphenyl) methyl-4-chloro-alpha-(methylethyl) benzeneacetate
Ficam	bendiocarb
flavomycin	bambermycins
fluvalinate	(alpha RS, 2R)-fluvalinate[(RS)-alpha-cyano-3-phenoxybenzyl (R)-2-[2-chloro-4-(trifluoromethyl)anilino]-3-methylbutanoate]
fosetyl Al	aluminum tris(O-ethyl phosphonate)

LIST OF COMPOUNDS CONSIDERED
Cross-referenced Compounds

Gardona	2-chloro-1-(2,4,5-trichlorophenyl) vinyl dimethyl phosphate, tetrachlorvinphos
Guthion	O,O-dimethyl S-[(4-oxo-1,2,3-benzotriazin-3(4H)-yl)methyl]phosphorodithioate, azinphos-methyl
"hexakis"	hexakis (2-methyl-2-phenylpropyl) distannoxane, fenbutatin oxide
hexakis (2-methyl-2-phenylpropyl) distannoxane	fenbutatin oxide, "hexakis"
isofenphos	1-methylethyl 2-((ethoxy-((1-methylethyl) amino)phosphinothioyl)oxy)benzoate
isopropyl m-chlorocarbanilate	chlorpropham
Kepone	chlordecone
Larvadex	cyromazine
mancozeb	zinc ion and maneb, coordination product
N-(mercaptomethyl) phthalimide S-(O,O-dimethyl phosphorodithioate	phosmet
methiocarb	3,5-dimethyl-4-(methylthio)phenyl methylcarbamate
methiocarb sulfoxide	3,5-dimethyl-4-(methylsulfinyl)phenyl methylcarbamate
m-(1-methylbutyl)phenyl methylcarbamate and m-(1-ethylpropyl) phenyl methylcarbamate, mixture	bufencarb
6-methyl-1,3-dithiolo[4,5-b] quinoxalin-2-one	oxythioquinox
1-methylethyl 2-((ethoxy-1 ((methylethyl)amino)phosphinothioyl)oxy)benzoate	isofenphos
2-methyl-2-(methylsulfinyl) propionaldehyde O-(methylcarbamoyl) oxime	aldicarb sulfoxide

LIST OF COMPOUNDS CONSIDERED
Cross-referenced Compounds

2-methyl-2-(methylsulfonyl)propionaldehyde O-(methylcarbamoyl) oxime	aldicarb sulfone
metiram	ammoniates of [ethylenebis(dithiocarbamato)] zinc and ethylenebis[dithiocarbamic acid] biomolecular and trimolecular cyclic anhydrosulfides and disulfides, Polyram
metribuzin	4-amino-6-(1,1-dimethylethyl)-3-(methylthio)-1,2,4-triazin-5(4H)-one, Sencor
mirex	dodecachlorooctahydro-1,3,4-metheno-2H-cyclobuta[cd]pentalene
nitrofen	2,4-dichlorophenyl p-nitrophenyl ether
nitromide	3,5-dinitrobenzamide
oxydemeton-methyl	S-[2-(ethylsulfinyl)ethyl] O,O-dimethyl phosphorothioate
oxythioquinox	6-methyl-1,3-dithiolo[4,5-b]quinoxalin-2-one
Perthane	1,1-dichloro-2,2-bis(p-ethylphenyl)ethane
phosmet	N-(mercaptomethyl) phthalimide S-(O,O-dimethyl phosphorodithioate
Plictran	cyhexatin, tricyclohexyltin hydroxide
Polyram	ammoniates of [ethylenebis(dithiocarbamato)]zinc and ethylenebis[dithiocarbamic acid] biomolecular and trimolecular cyclic anhydrosulfides and disulfides, metiram
potassium salt of 1-(4-chlorophenyl)-1,4-dihydro-6-methyl-4-oxypyridizine-3-carboxylic acid	fenridazone-potassium salt
pronamide	3,5-dichloro-N-(1,1-dimethyl-2-propynyl) benzamide, propyzamide
propachlor	2-chloro-N-isopropylacetanilide
propanil	Stam
propyzamide	3,5-dichloro-N-(1,1-dimethyl-2-propynyl)benzamide, pronamide
Ruelene	crufomate

**LIST OF COMPOUNDS CONSIDERED
Cross-referenced Compounds**

Sencor	4-amino-6-(1,1-dimethylethyl) 3-(methylthio)-1,2,4-triazin-5(4H)-one, metribuzin
sethoxydim	2-[1-(ethoxyimino)butyl]-5-[2-(ethylthio)propyl]- 3-hydroxy-2-cyclohexene-1-one
Stam	propanil
Strobane	terpene polychlorinates
sulprofos	O-ethyl-O-[4-(methylthio)phenyl] S-propyl phosphorodithioate
terpene polychlorinates	Strobane
tetrachlorvinphos	2-chloro-1-(2,4,5-trichlorophenyl) vinyl dimethyl phosphate, Gardona
S,S,S-tributyl phosphorotrithioate	DEF
trichlorfon (name used in 21 CFR)	dimethyl (2,2,2-trichloro-1-hydroxyethyl) phosphonate (name used in 40 CFR)
tricyclohexyltin hydroxide	cyhexatin, Plictran
Trithion	carbophenothion
Zinc ion and maneb, coordination product	mancozeb

Section 2

Introduction

This section provides information on residue limits in meat and poultry products applied by FSIS (as of July 1, 1989). These limits include tolerances and action levels developed by the Environmental Protection Agency (EPA) for pesticide chemicals, and by the Food and Drug Administration (FDA) for animal drugs and unavoidable contaminants. These limits are derived in most cases from the Code of Federal Regulations (CFR): pesticide limits from 40 CFR 180, those for animal drugs from 21 CFR 556, and unavoidable contaminants from 21 CFR 109. The approved use conditions for animal drugs can be found in 21 CFR 520, 522, 524, 526, 529 (new animal drugs not subject to certification), 540, 544, 546, 548 (antibiotic drugs for use with animals), and 558 (new animal drugs for use in animal feed). See Section 1.B of this document for relevant citations.

Formal tolerances are not established in all cases. For example, tolerance exemptions have been granted by FDA and EPA in approving the use of some pesticides and new animal drugs. For some unavoidable contamination situations, FDA and EPA, upon request, recommend action levels to FSIS; however, tolerances or action levels have not been established for all such situations. FSIS permits concentrations of residues in meat and poultry that do not exceed the residue limits published in this section.

The residue limits for poultry and livestock species are listed alphabetically by compound (which may include a compound's metabolites). The entries include, among other things, CFR or Federal Register (FR) citations for tolerances, and notations of action levels. Entries for animal drugs with "zero" or "no residue" tolerances also include, in parenthesis, the limits of quantification considered by FDA in approving uses of those drugs in food-producing animals. These limits are used by FDA for enforcement purposes, and are applied by FSIS in determining if product is adulterated.

Any residue of a new animal drug found in the edible tissues of a species for which the drug is not approved will be considered an adulterant, provided the residue is found at a concentration that can be quantified and confirmed by a validated analytical method. A concentration of a substance endogenous in the animal tissue in question would not be considered an adulterant.

Unless otherwise indicated, "meat byproducts" includes kidney and liver.

					RESIDUE LIMITS	
Compound	Reference	Cattle	Sheep/ Goats	Swine	Poultry	Horses
Units are parts per million						
Acephate and metabolite	40 CFR 180.108	0.1F	0.1F	0.1F	0.1F	0.1F
		0.1M	0.1M	0.1M	0.1M	0.1M
		0.1Mb	0.1Mb	0.1Mb	0.1Mb	0.1Mb
2-Acetyl-amino-5-nitrothiazole	21 CFR 556.20	-	-	-	0.1Et ¹	-
Aklomide and metabolite	21 CFR 556.30	-	-	-	4.5L ²	-
					4.5M ²	
					3S ²	
Alachlor and metabolites	40 CFR 180.249	0.02F	0.02F	0.02F	0.02F	0.02F
		0.02M	0.02M	0.02M	0.02M	0.02M
		0.02Mb	0.02Mb	0.02Mb	0.02Mb	0.02Mb
Albendazole	21 CFR 556.34	0.2L ³	-	-	-	-
Aldicarb and metabolites	40 CFR 180.269	0.01F	0.01F	0.01F	-	0.01F
		0.01M	0.01M	0.01M		0.01M
		0.01Mb	0.01Mb	0.01Mb		0.01Mb
Aldrin	51 FR 46662	0.3F ⁴	0.3F ⁴	0.3F ⁴	0.3F ⁴	0.3F ⁴
[1 Alpha-(S),3 - alpha(Z)]-(±)--cyano-(3-phenoxy-phenyl)methyl 3-(2-chloro-3, 3, 3-trifluoro-1-propenyl)-2, 2-dimethylcyclopropane carboxylate ⁵	40 CFR 180.438	0.01F	0.01F	0.01F	-	0.01F
		0.01M	0.01M	0.01M		0.01M
		0.01Mb	0.01Mb	0.01Mb		0.01Mb
(Alpha RS, 2R)-fluvalinate [(RS)-alpha-cyano-3-phenoxybenzyl (R)-2-[2-chloro-4-(trifluoromethyl)anilino]-3-methylbutanoate]	40 CFR 180.427	0.01F	0.01F	0.01F	0.01F	0.01F
		0.01M	0.01M	0.01M	0.01M	0.01M
		0.01Mb	0.01Mb	0.01Mb	0.01Mb	0.01Mb

1 Turkeys only.

2 Chickens only.

3 Tolerance for marker residue, the 2-aminosulfone.

4 Action Level.

5 Tolerances established until August 30, 1991.

KEY

Ek:Excluding kidneys

Et:Edible tissue

F:Fat

K:Kidney

L:Liver

M:Muscle

Mb:Meat byproducts

S:Skin

Sf:Skin with fat

Sm:Skeletal muscle

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					RESIDUE LIMITS	
Compound	Reference	Cattle	Sheep/ Goats	Swine	Poultry	Horses
Units are parts per million						
4-Amino-6-(1, 1-dimethylethyl)-3-(methylthio)-1, 2, 4-triazin-5(4H)-one and metabolites	40 CFR 180.332	0.7F	0.7F	0.7F	0.7F	0.7F
		0.7M	0.7M	0.7M	0.7M	0.7M
		0.7Mb	0.7Mb	0.7Mb	0.7Mb	0.7Mb
Amitraz and metabolites	40 CFR 180.287 53 FR 18898	0.1F	0F	0.1F	-	F0
		0.05M	0M	0.05M	-	0M
		0.3Mb	0Mb	0.3Mb	-	0Mb
				0.2K 0.2L		
Amoxicillin	21 CFR 556.38	0.01Et	-	-	-	-
Ampicillin	21 CFR 556.40	0.01Et	-	0.01Et	-	-
Amprolium	21 CFR 556.50	2.0F ¹ 0.5K ¹ 0.5L ¹ 0.5M ¹	-	-	1K ² 1L ² 0.5M ²	-
Apramycin	21 CFR 556.52	-	-	0.4F ³ 0.4K ³ 0.3L ³ 0.1M ³	-	-
Arsenic	21 CFR 556.60	-	-	2K 2L 0.5M 0.5Mb	0.5M 2Mb	-
Atrazine	40 CFR 180.220	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb	0.02F 0.02F 0.02Mb	0.02F 0.02M 0.02Mb
Avermectin ⁴	40 CFR 180.449 54 FR 31836	0.01F	-	-	-	-
		0.02M	-	-	-	-
		0.02Mb	-	-	-	-
Bacitracin	21 CFR 556.70	0.5Et	-	0.5Et	0.5Et ⁵	-

1 Calves only.

2 Chickens and turkeys.

3 Total residues.

4 Tolerances (for residues resulting from use as a pesticide) established until March 31, 1993.

5 Also pheasant and quail.

KEY

Ek:Excluding kidneys

Et:Edible tissue

F:Fat

K:Kidney

L:Liver

M:Muscle

Mb:Meat byproducts

S:Skin

Sf:Skin with fat

Sm:Skeletal muscle

Compound	Reference	Cattle	Sheep/ Goats	Swine	RESIDUE LIMITS	
					Poultry	Horses
			Units are parts per million			
Benomyl and metabolites	40 CFR 180.294	0.1F	0.1F	0.1F	0.1F	0.1F
		0.1M	0.1M	0.1M	0.2L	0.1M
		0.1Mb	0.1Mb	0.1Mb	0.1M	0.1Mb
					0.1Mb	
Bentazon and metabolite	40 CFR 180.355	0.05F	0.05F	0.05F	0.05F	-
		0.05M	0.05M	0.05M	0.05M	
		0.05Mb	0.05Mb	0.05Mb	0.05Mb	
BHC	51 FR 25697	0.3F ¹	0.3F ¹	0.3F ¹	0.3F ¹	0.3F ¹
Bifenthrin ²	40 CFR 180.442	0.1F	0.1F	0.1F	-	0.1F
		0.1M	0.1M	0.1M		0.1M
		0.1Mb	0.1Mb	0.1Mb		0.1Mb
Bromoxynil	40 CFR 180.324	0.1F	0.1F	0.1F	-	0.1F
		0.1M	0.1M	0.1M		0.1M
		0.1Mb	0.1Mb	0.1Mb		0.1Mb
Buquinolate	21 CFR 556.90	-	-	-	0.4K ³	-
					0.4L ³	
					0.1M ³	
					0.4Sf ³	
sec-Butylamine	40 CFR 180.321	0.75F	-	-	-	-
		3K				
		0.75M				
		0.75Mb				
Cacodylic acid (as As ₂ O ₃)	40 CFR 180.311	0.7F	-	-	-	-
		1.4K				
		1.4L				
		0.7M				
		0.7Mb				
Captan	40 CFR 180.103	0.05F	-	0.05F	-	-
		0.05M		0.05M		
		0.05Mb		0.05Mb		
Carbadox and metabolite	21 CFR 556.100	-	-	0(0.030)Et	-	-

1 Action Level.

2 Tolerances established until October 31, 1992.

3 Chickens only.

KEY

Ek:Excluding kidneys

Et:Edible tissue

F:Fat

K:Kidney

L:Liver

M:Muscle

Mb:Meat byproducts

S:Skin

Sf:Skin with fat

Sm:Skeletal muscle

January, 1990

2.4

Compound	Reference	Cattle	Sheep/ Goats	Swine	RESIDUE LIMITS	
					Poultry	Horses
			Units are parts per million			
Carbaryl and metabolites	40 CFR 180.169	0.1F	0.1F	0.1F	5F	0.1F
		1K	1K	1K		1K
		1L	1L	1L		1L
		0.1M	0.1M	0.1M	5M	0.1M
		0.1Mb	0.1Mb	0.1Mb		0.1Mb.
Carbofuran and metabolites ¹	40 CFR 180.254	0.05F	0.05F	0.05F	-	0.05F
		0.05M	0.05M	0.05M	-	0.05M
		0.05Mb	0.05Mb	0.05Mb	-	0.05Mb
Carbomycin	21 CFR 556.110	-	-	-	0(0.5)Et ²	-
Carbopheno- thion	40 CFR 180.156	0.1F	0.1F	0.1F	-	-
Carboxin and metabolite	40 CFR 180.301	0.1F	0.1F	0.1F	0.1F	0.1F
		0.1M	0.1M	0.1M	0.1M	0.1M
		0.1Mb	0.1Mb	0.1Mb	0.1Mb	0.1Mb
Ceftiofur	21 CFR 556.113	- ³				
Cephapirin	21 CFR 556.115	0.1Et	-	-	-	-
Chlordane	51 FR 46665	0.3F ⁴	0.3F ⁴	0.3F ⁴	0.3F ⁴	0.3F ⁴
Chlordimeform and metabolites	40 CFR 180.285	0.25F	0.25F	0.25F	0.25F	0.25F
		0.25M	0.25M	0.25M	0.25M	0.25M
		0.25Mb	0.25Mb	0.25Mb	0.25Mb	0.25Mb
Chlorhexidine	21 CFR 556.120	0(0.001)Et ⁵	-	-	-	-
2-Chloro-1- (2,4-dichlorophenyl) vinyl diethyl phosphate	40 CFR 180.322	0.2F	0.2F ⁶	0.005F	0.005F	0.005F
2-Chloro-N-iso- propylacetanilide	40 CFR 180.211	0.02F	0.02F	0.02F	0.02F	0.02F
		0.02M	0.02M	0.02M	0.02M	0.02M
		0.02Mb	0.02Mb	0.02Mb	0.02Mb	0.02Mb
Chloroneb and metabolite	40 CFR 180.257	0.2F	0.2F	0.2F		0.2F
		0.2M	0.2M	0.2M		0.2M
		0.2Mb	0.2Mb	0.2Mb		0.2Mb

1 No more than 0.02 can be carbamates.

2 Chickens only.

3 Tolerance for marker residue not needed.

4 Action level.

5 Calves only.

6 Sheep only; goats 0.005F.

KEY

Ek:Excluding kidneys

Et:Edible tissue

F:Fat

K:Kidney

L:Liver

M:Muscle

Mb:Meat byproducts

S:Skin

Sf:Skin with fat

Sm:Skeletal muscle

					RESIDUE LIMITS	
Compound	Reference	Cattle	Sheep/ Goats	Swine	Poultry	Horses
Units are parts per million						
1-(4-Chlorophen- oxy)-3, 3-dimethyl- 1-(1H-1, 2, 4-triazol- 1-yl)-2-butanone and metabolites	40 CFR 180.410	1.0F	1.0F	0.04F	0.04F	1.0F
		1.0M	1.0M	0.04M	0.04M	1.0M
		1.0Mb	1.0Mb	0.04Mb	0.04Mb	1.0Mb
2-(m-Chloro- phenoxy) propionic acid	40 CFR 180.325	0.05F	0.05F	0.05F	0.05F	0.05F
		0.5K	0.5K	0.5K		0.5K
		0.05M	0.05M	0.05M	0.05M	0.05M
		0.05Mb	0.05Mb	0.05Mb	0.05Mb	0.05Mb
2-Chloro-1-(2, 4,5-trichlorophenyl) vinyl dimethyl phosphate	40 CFR 180.252	1.5F	0.5F	1.5F	0.75F	0.5F
Chlorpyrifos and metabolite	40 CFR 180.342	2.0F	1.0F	0.5F	0.5F	1.0F
		2.0M	1.0M	0.5M	0.5M	1.0M
		2.0Mb	1.0Mb	0.5Mb	0.5Mb	1.0Mb
Chlorpyrifos- methyl and metabolite	40 CFR 180.419	0.5F	0.5F	0.5F	0.5F	0.5F
		0.5M	0.5M	0.5M	0.5M	0.5M
		0.5Mb	0.5Mb	0.5Mb	0.5Mb	0.5Mb
Chlorsulfuron	40 CFR 180.405	0.3F	0.3F	0.3F	-	0.3F
		0.3M	0.3M	0.3M		0.3M
		0.3Mb	0.3Mb	0.3Mb		0.3Mb
Chlortetracycline	21 CFR 556.150	0F ¹	-	0.2F	1F	-
		0.1K ¹	1K ²	4K	4K	
		0.1L ¹	0.5L ²	2L	1L	
		0.1M ¹	0.1M ²	1M	1M	
				1S		
Clopidol	21 CFR 556.160	3K	3K	0.2Et	15K	-
		1.5L	1.5L		15L	
		0.2M	0.2M		5M	
Clopyralid	40 CFR 180.431	1.0F	1.0F	0.2F	0.2F	1.0F
		12.0K	12.0K	-	-	12.0K
		1.0M	1.0M	0.2M	0.2M	1.0M
		1.0Mb	1.0Mb	0.2Mb	0.2Mb	1.0Mb

1 Cattle only; calves 1F, 4K,
4L, 1M.
2 Sheep only.

KEY

Ek: Excluding kidneys	M: Muscle
Et: Edible tissue	Mb: Meat byproducts
F: Fat	S: Skin
K: Kidney	Sf: Skin with fat
L: Liver	Sm: Skeletal muscle

					RESIDUE LIMITS	
Compound	Reference	Cattle	Sheep/ Goats	Swine	Poultry	Horses
Units are parts per million						
Clorsulon	21 CFR 556.163	1.0K ¹	-	-	-	-
Cloxacillin	21 CFR 556.165	0.01Et	-	-	-	-
Coumaphos and oxygen analog	40 CFR 180.189	1F 1M 1Mb	1F 1M 1Mb	1F 1M 1Mb	1F 1M 1Mb	1F 1M 1Mb
Crufomate	40 CFR 180.295	1F 1M 1Mb	1F 1M 1Mb	-	-	-
Cyano (3-phenoxy-phenyl)methyl-4-chloro-a-(methyl-ethyl)benzeneacetate	40 CFR 180.379	1.5F 1.5M 1.5Mb	1.5F 1.5M 1.5Mb	1.5F 1.5M 1.5Mb	-	1.5F 1.5M 1.5Mb
Cyfluthrin	40 CFR 180.436	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	-	0.05F 0.05M 0.05Mb
Cyhexatin and metabolites	40 CFR 180.144	0.2F 0.5K 0.5L 0.2M 0.2Mb	0.2F 0.5K 0.5L 0.2M 0.2Mb	0.2F 0.5K 0.5L 0.2M 0.2Mb	-	0.2F 0.5K 0.5L 0.2M 0.2Mb
Cypermethrin ²	40 CFR 180.418	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	-	0.05F 0.05M 0.05Mb
Cyromazine	40 CFR 180.414	-	-	-	0.05F ³ 0.05M ³ 0.05Mb ³	-
2, 4-D and metabolite	40 CFR 180.142	0.2F 2K 0.2M 0.2Mb	0.2F 2K 0.2M 0.2Mb	0.2F 2K 0.2M 0.2Mb	0.05F 0.05K 0.05M 0.05Mb	0.2F 2K 0.2M 0.2Mb

1 Tolerance for clorsulon corresponds to 3.0 total residues in kidney.

2 Tolerances established until December 31, 1989.

3 Chicken layer hens and breeder hens; tolerance for parent cyromazine; an additional tolerance of 0.05F, M, Mb exists for the metabolite, melamine.

KEY

Ek:Excluding kidneys

Et:Edible tissue

F:Fat

K:Kidney

L:Liver

M:Muscle

Mb:Meat byproducts

S:Skin

Sf:Skin with fat

Sm:Skeletal muscle

Compound	Reference	Cattle	RESIDUE LIMITS			
			Sheep/ Goats	Swine	Poultry	Horses
			Units are parts per million			
Dalapon	40 CFR 180.150	0.2M 0.2Mb	0.2M 0.2Mb	0.2M 0.2Mb	3Ek 9K	-
Daminozide	40 CFR 180.246	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb 2K	0.2F 0.2M 0.2Mb
DDT and metabolites	51 FR 46658	5F ¹	5F ¹	5F ¹	5F ¹	5F ¹
Decoquatate	21 CFR 556.170	2Et 1Sm	2Et ² 1Sm ²	-	2Et ³ 1Sm ³	-
Dialifor and oxygen analog	40 CFR 180.326	0.15F 0.15M 0.15Mb	0.15F 0.15M 0.15Mb	-	0.05F 0.05M 0.05Mb	-
Diazinon	40 CFR 180.153	0.7F 0.7M 0.7Mb	0.7F ⁴ 0.7M ⁴ 0.7Mb ⁴	-	-	-
Dicamba and metabolite	40 CFR 180.227	0.2F 1.5K 1.5L 0.2M 0.2Mb	0.2F 1.5K 1.5L 0.2M 0.2Mb	0.2F 1.5K 1.5L 0.2M 0.2Mb	-	0.2F 1.5K 1.5L 0.2M 0.2Mb
3, 5-Dichloro-N-(1,1-dimethyl-2-propynyl)benzamide and metabolites	40 CFR 180.317	0.02F 0.2K 0.2L 0.02M 0.02Mb	0.02F 0.2K 0.2L 0.02M 0.02Mb	0.02F 0.2K 0.2L 0.02M 0.02Mb	0.02F 0.2K 0.2L 0.02M 0.02Mb	0.02F 0.2K 0.2L 0.02M 0.02Mb
1, 1-Dichloro-2, 2-bis(p-ethylphenyl) ethane	40 CFR 180.139	0M	0M	0M	0M	0M
1-[[2-(2, 4-Dichlorophenyl)-4-propyl-1, 3-dioxolan-2-yl]methyl]-1-H-1, 2, 4 triazole and metabolites	40 CFR 180.434	0.1F 2.0K ⁵ 2.0L ⁵ 0.1M 0.1Mb	0.1F 2.0K ⁵ 2.0L ⁵ 0.1M 0.1Mb	0.1F 2.0K ⁵ 2.0L ⁵ 0.1M 0.1Mb	0.1F 0.2K 0.2L 0.1M 0.1Mb	0.1F 2.0K ⁵ 2.0L ⁵ 0.1M 0.1Mb

1 Action level.
2 Goats only.
3 Chickens only.
4 Sheep only.
5 Tolerances established until June 21, 1991.

KEY

Ek:Excluding kidneys	M:Muscle
Et:Edible tissue	Mb:Meat byproducts
F:Fat	S:Skin
K:Kidney	Sf:Skin with fat
L:Liver	Sm:Skeletal muscle

RESIDUE LIMITS

Compound	Reference	Cattle	Sheep/ Goats	Swine	Poultry	Horses
			Units are parts per million			
Dichlorvos	40 CFR 180.235 21 CFR 556.180	0.02F	0.02F	0.1F	0.05F	0.02F
		0.02M	0.02M	0.1M	0.05M	0.02M
		0.02Mb	0.02Mb	0.1Mb	0.05Mb	0.02Mb
Dieldrin	51 FR 46662	0.3F ¹	0.3F ¹	0.3F ¹	0.3F ¹	0.3F ¹
O, O-Diethyl O-(p-(methylsul- finyl)phenyl- phosphorothioate and metabolites	40 CFR 180.234	0.02F	0.02F	0.02F	-	0.02F
		0.02M	0.02M	0.02M		0.02M
		0.02Mb	0.02Mb	0.02Mb		0.02Mb
Difenzoquat	40 CFR 180.369	0.05F	0.05F	0.05F	0.05F	0.05F
		0.05M	0.05M	0.05M	0.05M	0.05M
		0.05Mb	0.05Mb	0.05Mb	0.05Mb	0.05Mb
Diflubenzuron	40 CFR 180.377	0.05F	0.05F	0.05F	0.05F	0.05F
		0.05M	0.05M	0.05M	0.05M	0.05M
		0.05Mb	0.05Mb	0.05Mb	0.05Mb	0.05Mb
Dihydro- streptomycin	21 CFR 556.200	0(0.5)Et ^{2,3}	-	-	-	-
Dimethipin	40 CFR 180.406	0.02F	0.02F	0.02F	-	0.02F
		0.02M	0.02M	0.02M		0.02M
		0.02Mb	0.02Mb	0.02Mb		0.02Mb
Dimethoate and oxygen analog	40 CFR 180.204	0.02F	0.02F	0.02F	0.02F	0.02F
		0.02M	0.02M	0.02M	0.02M	0.02M
		0.02Mb	0.02Mb	0.02Mb	0.02Mb	0.02Mb
O, O-Dimethyl S- [(4-oxo-1, 2, 3- benzotriazin- 3(4H)-yl)methyl] phosphorodithioate	40 CFR 180.154	0.1F	0.1F	-	-	0.1F
		0.1M	0.1M			0.1M
		0.1Mb	0.1Mb			0.1Mb
O, O-Dimethyl O-p-(dimethylsulfa- moyl)phenyl phosphorothioate and oxygen analog	40 CFR 180.233	0.1F	-	-	-	-
		0.1M				
		0.1Mb				

1 Action level.

2 Calves only.

3 Administrative tolerance in
calves and cattle 2.0K.

KEY

Ek: Excluding kidneys

Et: Edible tissue

F: Fat

K: Kidney

L: Liver

M: Muscle

Mb: Meat byproducts

S: Skin

Sf: Skin with fat

Sm: Skeletal muscle

Compound	Reference	Cattle	Sheep/ Goats	Swine	RESIDUE LIMITS	
					Poultry	Horses
			Units are parts per million			
Dimethyl phosphate of a-methylbenzyl 3-hydroxycis-crotonate	40 CFR 180.280	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb	-	-
N, N-Dimethylpiperidinium chloride	40 CFR 180.384	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb
3, 5-Dinitrobenzamide	21 CFR 556.220	-	-	-	0(0.020)Et ¹ -	
Dioxathion	40 CFR 180.171	1F	1F	1F	-	1F
Diphenamid	40 CFR 180.230	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	-	0.05F 0.05M 0.05Mb
Diphenylamine	40 CFR 180.190	0M	0M	0M	0M	0M
Dipropyl isocinchomerate	40 CFR 180.143	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	-	0.1F 0.1M 0.1Mb
Diquat	40 CFR 180.226	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb
Diuron	40 CFR 180.106	1F 1M 1Mb	1F 1M 1Mb	1F 1M 1Mb	-	1F 1M 1Mb
Dodecachlorooctahydro-1, 3, 4-metheno-2H-cyclobuta(cd) pentalene	51 FR 45114	0.1F ²	0.1F ²	0.1F ²	0.1F ²	0.1F ²
Dodine	40 CFR 180.172	0M	0M	0M	0M	0M
Endosulfan and metabolite	40 CFR 180.182	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb	-	0.2F 0.2M 0.2Mb

1 Chickens only.

2 Action level.

KEY

Ek:Excluding kidneys

Et:Edible tissue

F:Fat

K:Kidney

L:Liver

M:Muscle

Mb:Meat byproducts

S:Skin

St:Skin with fat

Sm:Skeletal muscle

Compound	Reference	Cattle	Sheep/ Goats	Swine	RESIDUE LIMITS	
					Poultry	Horses
			Units are parts per million			
Endrin	MPI Dir 917.1	0.3F ¹	0.3F ¹	0.3F ¹	0.3F ¹	0.3F ¹
Erythromycin	21 CFR 556.230	0(0.3)Et	-	0.1Et	0.125Et	-
Estradiol benzoate	21 CFR 556.240	480F ² 360K ² 240L ² 120M ²	600F ³ 600K ³ 600L ³ 120M ³	-	-	-
Estradiol monopalmitate	21 CFR 556.250	-	-	-	0(0.002)Et ⁴	-
Ethalfuralin	40 CFR 180.416	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb
Ethephon	40 CFR 180.300	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	-	0.1F 0.1M 0.1Mb
Ethion and oxygen analog	40 CFR 180.173	2.5F 2.5M ⁵ 1.0Mb	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb
Ethofumesate and metabolites	40 CFR 180.345	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	-	0.05F 0.05M 0.05Mb
Ethopabate	21 CFR 556.260	-	-	-	1.5K ⁶ 1.5L ⁶ 0.5M ⁶	-
2-[1-(Ethoxy-imino)butyl]-5-[2-(ethylthio)-propyl]-3-hydroxy-2-cyclohexene-1-one and metabolites	40 CFR 180.412	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb

1 Action level.

2 Heifers, steers, and calves (ppt); above concentrations naturally present.

3 Lambs only (ppt); above concentrations naturally present.

4 Chickens only.

5 Fat basis.

6 Chickens only.

KEY

Ek:Excluding kidneys

Et:Edible tissue

F:Fat

K:Kidney

L:Liver

M:Muscle

Mb:Meat byproducts

S:Skin

Sf:Skin with fat

Sm:Skeletal muscle

		RESIDUE LIMITS				
Compound	Reference	Cattle	Sheep/ Goats	Swine	Poultry	Horses
			Units are parts per million			
Ethoxyquin	21 CFR 172.140	5F	5F	5F	3F	5F
		-	-	-	3L	-
		0.5M	0.5M	0.5M	0.5M	0.5M
5-Ethoxy-3-(tri-chloromethyl)-1, 2, 4-thiadiazole and metabolite	40 CFR 180.370	0.10F	0.10F	0.10F	0.10F	0.10F
		0.10M	0.10M	0.10M	0.10M	0.10M
		0.10Mb	0.10Mb	0.10Mb	0.10Mb	0.10Mb
Ethyl 4, 4'-dichlorobenzilate (chlorobenzilate)	40 CFR 180.109	0.5F	0.5F ¹	-	-	-
		0.5M	0.5M ¹			
		0.5Mb	0.5Mb ¹			
Ethyl 3-methyl-4-(methylthio)phenyl (1-methylethyl) phosphoramidate	40 CFR 180.349	0.05F	0.05F	0.05F	-	0.05F
		0.05M	0.05M	0.05M		0.05M
		0.05Mb	0.05Mb	0.05Mb		0.05Mb
O-Ethyl-O-[4-(methylthio)phenyl]S-propyl phosphorodithioate and metabolites	40 CFR 180.374	0.1F	0.1F	0.1F	0.01F	0.1F
		0.1M	0.1M	0.1M	0.01M	0.1M
		0.1Mb	0.1Mb	0.1Mb	0.01Mb	0.1Mb
S-[2-(Ethylsulfinyl)ethyl]O, O-dimethylphosphorothioate and metabolites	40 CFR 180.330	0.01F	0.01F	0.01F	-	0.01F
		0.01M	0.01M	0.01M		0.01M
		0.01Mb	0.01Mb	0.01Mb		0.01Mb
Fenarimol	40 CFR 180.421	0.1F	0.1F	0.1F	0.01F	0.1F
		0.1K	0.1K	0.1K		0.1K
		0.1L	0.1L	0.1L		0.1L
		0.01M	0.01M	0.01M	0.01M	0.01M
		0.01Mb	0.01Mb	0.01Mb	0.01Mb	0.01Mb
Fenbendazole	21 CFR 556.275	0.8L ²	-	. ³	-	-
Fenprostalene	21 CFR 556.277	- ⁴	-	-	-	-

1 Sheep only.

2 Tolerance for parent fenbendazole; corresponds to 10 ppm total residues in liver.

3 Tolerance for marker residues not needed.

4 Tolerance for marker residues not needed.

KEY

Ek:Excluding kidneys

Et:Edible tissue

F:Fat

K:Kidney

L:Liver

M:Muscle

Mb:Meat byproducts

S:Skin

Sf:Skin with fat

Sm:Skeletal muscle

RESIDUE LIMITS

Compound	Reference	Cattle	Sheep/ Goats	Swine	Poultry	Horses
			Units are parts per million			
Fenridazon, potassium salt	40 CFR 180.423	0.05F	0.05F	0.05F	0.30F	0.05F
		1.0K	1.0K	1.0K		1.0K
		1.0L	1.0L	1.0L		1.0L
		0.05M	0.05M	0.05M	0.30M	0.05M
		0.05Mb	0.05Mb	0.05Mb	0.30Mb	0.05Mb
Fenthion and metabolites	40 CFR 180.214	0.1F	-	0.1F	0.1F	-
		0.1M		0.1M	0.1M	
		0.1Mb		0.1Mb	0.1Mb	
Fluazifop and butyl ester	40 CFR 180.411	0.05F	0.05F	0.05F	0.05F	0.05F
		0.05M	0.05M	0.05M	0.05M	0.05M
		0.05Mb	0.05Mb	0.05Mb	0.05Mb	0.05Mb
Flucythrinate	40 CFR 180.400	1.0F	1.0F	1.0F	-	1.0F
		0.1M	0.1M	0.1M		0.1M
		0.1Mb	0.1Mb	0.1Mb		0.1Mb
Fluridone	40 CFR 180.420	0.05F	0.05F	0.05F	0.05F	0.05F
		0.1K	0.1K	0.1K	0.1K	0.1K
		0.1L	0.1L	0.1L	0.1L	0.1L
		0.05M	0.05M	0.05M	0.05M	0.05M
		0.05Mb	0.05Mb	0.05Mb	0.05Mb	0.05Mb
Fluzilazol ¹	53 FR 34513	0.10L	0.10L	0.10L	-	0.10L
		0.01M	0.01M	0.01M		0.01M
		0.01Mb	0.01Mb	0.01Mb		0.01Mb
Furazolidone	21 CFR 556.290	-	-	0(0.100)Et	-	-
Gentamicin sulfate	21 CFR 556.300	-	-	0.4F	0.1Et ²	-
				0.4K		
				0.3L		
				0.1M		
Glyphosate and metabolite	40 CFR 180.364	0.5K	0.5K	0.5K	0.5K	0.5K
		0.5L	0.5L	0.5L	0.5L	0.5L
Halofuginone	21 CFR 556.308	-	-	-	0.1L ³	-
Haloxon	21 CFR 556.310	0.1Et	-	-	-	-

1 Tolerances established until October 9, 1989.

2 Turkeys only.

3 Broiler chickens only;
tolerance for parent
halofuginone; corresponds to
0.3 ppm total residues in liver.

KEY

Ek:Excluding kidneys

Et:Edible tissue

F:Fat

K:Kidney

L:Liver

M:Muscle

Mb:Meat byproducts

S:Skin

Sf:Skin with fat

Sm:Skeletal muscle

January, 1990

2.13

Compound	Reference	Cattle	RESIDUE LIMITS			
			Sheep/ Goats	Swine	Poultry	Horses
			Units are parts per million			
HCB	MPI Dir 917.1	0.5F ¹	0.5F ¹	0.5F ¹	0.5F ¹	0.5F ¹
Heptachlor and heptachlor epoxide	40 CFR 180.104 MPI Dir 917.1	0.2F ¹	0.2F ¹	0.2F ¹	0.2F ¹	0.2F ¹
		0.2M ¹	0.2M ¹	0.2M ¹	0.2M ¹	0.2M ¹
		0.2Mb ¹	0.2Mb ¹	0.2Mb ¹	0.2Mb ¹	0.2Mb ¹
Hexakis (2-methyl-2- phenylpropyl) distannoxane	40 CFR 180.362	0.5F	0.5F	0.5F	0.1F	0.5F
		0.5M	0.5M	0.5M	0.1M	0.5M
		0.5Mb	0.5Mb	0.5Mb	0.1Mb	0.5Mb
Hexazinone and metabolite	40 CFR 180.396	0.1F	0.1F	0.1F	0.1F	0.1F
		0.1M	0.1M	0.1M	0.1M	0.1M
		0.1Mb	0.1Mb	0.1Mb	0.1Mb	0.1Mb
Hygromycin B	21 CFR 556.330	-	-	0Et (0.9M) (1.4K)	0Et (0.9M) (1.4K)	-
Imazalil and metabolites	40 CFR 180.413	0.01F	0.01F	0.01F	-	0.01F
		0.50L	0.50L	0.50L		0.50L
		0.01M	0.01M	0.01M		0.01M
		0.01Mb	0.01Mb	0.01Mb		0.01Mb
Iprodione and metabolites	40 CFR 180.399	0.5F	0.5F	0.5F	2.0F	0.5F
		3.0K	3.0K	3.0K		3.0K
		3.0L	3.0L	3.0L	3.0L	3.0L
		0.5M	0.5M	0.5M	0.5M	0.5M
		0.5Mb	0.5Mb	0.5Mb	0.5Mb	0.5Mb
Isopropyl carbanilate (IPC)	40 CFR 180.319 ²	0.05F	0.05F	0.05F	0.05F	0.05F
		0.05M	0.05M	0.05M	0.05M	0.05M
		0.05Mb	0.05Mb	0.05Mb	0.05Mb	0.05Mb

1 Action level.

2 Interim tolerance.

KEY

Ek:Excluding kidneys

Et:Edible tissue

F:Fat

K:Kidney

L:Liver

M:Muscle

Mb:Meat byproducts

S:Skin

Sf:Skin with fat

Sm:Skeletal muscle

January, 1990

2.14

RESIDUE LIMITS

Compound	Reference	Cattle	Sheep/ Goats	Swine	Poultry	Horses
			Units are parts per million			
Isopropyl m-chlorocar- banilate (CIPC)	40 CFR 180.319 ¹	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb
Ivermectin	21 CFR 556.344	15L ²	30L ³	20L ⁴	-	-
Lasalocid	21 CFR 556.347	0.7L ⁵	- ⁶	-	0.3Sf ⁷	-
Levamisole hydrochloride	21 CFR 556.350	0.1Et	0.1Et ⁸	0.1Et	-	-
Lincomycin	21 CFR 556.360	-	-	0.1Et	0.1Et ⁹	-
Lindane	40 CFR 180.133 MPI Dir. 917.1	7F	7F	4F	4F ¹⁰	7F
Linuron	40 CFR 180.184	1F 1M 1Mb	1F 1M 1Mb	1F 1M 1Mb	- - -	1F 1M 1Mb
Maduramicin ammonium	21 CFR 556.375	-	-	-	0.38F ¹¹	-
Malathion	40 CFR 180.111	4F 4M 4Mb	4F 4M 4Mb	4F 4M 4Mb	4F 4M 4Mb	4F 4M 4Mb

1 Interim tolerance.

2 Tolerance in ppb for 22,
23 dihydroavermectin B₁a;
corresponds to 50 ppb total
residues in liver.

3 Sheep only; tolerance in ppb for
22, 23 dihydroavermectin B₁a;
corresponds to 125 ppb total residues in liver.

4 Tolerance in ppb for 22, 23-
dihydroavermectin B₁a; corresponds
to 75 ppb total residues in liver.

5 Tolerance for parent lasalocid;
corresponds to 4.8 total residues in liver.

6 Tolerance for marker residue
not needed. Sheep only.

7 Chickens only; tolerance for parent
lasalocid; corresponds to 7.2 total residues
in liver.

8 Sheep only.

9 Chickens only.

10 Action level.

11 Chickens only; tolerance for marker residue.

KEY

Ek:Excluding kidneys

Et:Edible tissue

F:Fat

K:Kidney

L:Liver

M:Muscle

Mb:Meat byproducts

S:Skin

Sf:Skin with fat

Sm:Skeletal muscle

January, 1990
2.15

Compound	Reference	Cattle	RESIDUE LIMITS			
			Sheep/ Goats	Swine	Poultry	Horses
			Units are parts per million			
Melengestrol acetate	21 CFR 556.380	0(0.025)Et	-	-	-	-
N-(Mercapto-methyl)phthalimide	40 CFR 180.261	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb	-	0.2F 0.2M 0.2Mb
S-(O, O-dimethyl phosphorodithioate) and oxygen analog						
Metalaxyl and metabolites	40 CFR 180.408	0.4F 0.4K 0.4L 0.05M 0.05Mb	0.4F 0.4K 0.4L 0.05M 0.05Mb	0.4F 0.4K 0.4L 0.05M 0.05Mb	0.4F 0.4K 0.4L 0.05M 0.05Mb	0.4F 0.4K 0.4L 0.05M 0.05Mb
Methidathion	40 CFR 180.298	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb
Methoprene	40 CFR 180.359	0.3F 0.1M 0.1Mb	0.3F 0.1M 0.1Mb	0.3F 0.1M 0.1Mb	0.5F 0.5M 0.05Mb	0.3F 0.1M 0.1Mb
Methoxychlor	40 CFR 180.120 MPI Dir. 917.1	3F	3F	3F	3F ¹	3F
2-Methyl-4-chlorophenoxy-acetic acid and metabolite	40 CFR 180.339	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	-	0.1F 0.1M 0.1Mb
6-Methyl-1, 3-dithiolo(4, 5-b) quinoxalin-2-one	40 CFR 180.338	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	-	0.05F 0.05M 0.05Mb
1-Methylethyl 2-((ethoxy ((1-methylethyl) amino)phosphino-thioyl)oxy)benzoate and metabolites	40 CFR 180.387	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb

1 Action level.

KEY

Ek:Excluding kidneys	M:Muscle
Et:Edible tissue	Mb:Meat byproducts
F:Fat	S:Skin
K:Kidney	Sf:Skin with fat
L:Liver	Sm:Skeletal muscle

RESIDUE LIMITS

Compound	Reference	Cattle	Sheep/ Goats	Swine	Poultry	Horses
			Units are parts per million			
Metolachlor and metabolites	40 CFR 180.368	0.02F	0.02F	0.02F	0.02F	0.02F
		0.2K	0.2K	0.2K	-	0.2K
		0.05L	0.05L	0.05L	0.05L	0.05L
		0.02M	0.02M	0.02M	0.02M	0.02M
		0.02Mb	0.02Mb	0.02Mb	0.02Mb	0.02Mb
Metoserpate hydrochloride	21 CFR 556.410	-	-	-	0.02Et ¹	-
Metsulfuron methyl	40 CFR 180.428	0.1F	0.1F	0.1F	-	0.1F
		0.1M	0.1M	0.1M	-	0.1M
		0.1Mb	0.1Mb	0.1Mb	-	0.1Mb
Monensin	21 CFR 556.420	0.05Et	-	-	- ²	-
Morantel tartrate	21 CFR 556.425	0.70L ³	-	-	-	-
Myclobutanil	40 CFR 180.443	0.05F	0.05F	0.05F	0.02F	0.05F
		0.3L	0.3L	0.3L	-	0.3L
		0.05M	0.05M	0.05M	0.02M	0.05M
		0.05Mb	0.05Mb	0.05Mb	0.02Mb	0.05Mb
Naled and metabolite	40 CFR 180.215	0.05F	0.05F	0.05F	0.05F	0.05F
		0.05M	0.05M	0.05M	0.05M	0.05M
		0.05Mb	0.05Mb	0.05Mb	0.05Mb	0.05Mb
Narasin	21 CFR 556.428	-	-	-	- ⁴	-
Neomycin	21 CFR 556.430	0.25Et ⁵	-	-	-	-
		1.00F ⁶	1.25F ⁶	1.00F ⁶	0.50F ⁶	-
		0.75K ⁶	1.25K ⁶	1.00K ⁶	1.00K ⁶	-
		0.50L ⁶	1.25L ⁶	0.75L ⁶	0.75L ⁶	-
		0.25M ⁶	0.25M ⁶	0.25M ⁶	0.25M ⁶	0.25M ⁶

1 Chickens only.

2 Chickens, turkeys, and quail;
tolerance for marker residue
not needed.

3 Tolerance for marker residue N-methyl-
1,3-propanediamine(MAPA); corresponds to 2.40
ppm total residues in liver.

4 Chickens only; tolerance not needed.

5 Calves only.

6 Action level (letter from J. Taylor of FDA to
L. Crawford of FSIS, January 26, 1988).

KEY

Ek:Excluding kidneys

Et:Edible tissue

F:Fat

K:Kidney

L:Liver

M:Muscle

Mb:Meat byproducts

S:Skin

Sf:Skin with fat

Sm:Skeletal muscle

Compound	Reference	Cattle	RESIDUE LIMITS			
			Sheep/ Goats	Swine	Poultry	Horses
			Units are parts per million			
Nequinat	21 CFR 556.440	-	-	-	0.1Et ¹	-
Nicarbazin	21 CFR 556.445	-	-	-	4K ¹ 4L ¹ 4M ¹ 4S ¹	-
Nicotine	40 CFR 180.167a	-	-	-	1F 1M 1Mb	-
Nitrapyrin and metabolite	40 CFR 180.350	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb
Norflurazon	40 CFR 180.356	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb
Novobiocin	21 CFR 556.460	1Et	-	-	1Et	-
Nystatin	21 CFR 556.470	-	-	0(5.6)Et	0(5.6)Et	-
N-Octyl bicyclo- heptenedicar- boximide	40 CFR 180.367	0.3F	0.3F	0.3F	-	0.3F
Oleandomycin	21 CFR 556.480	-	-	0.15Et	0.15Et	-
Ormetoprim	21 CFR 556.490	-	-	-	0.1Et	-
Oxadiazon and metabolites	40 CFR 180.346	0.01F 0.01M 0.01Mb	0.01F 0.01M 0.01Mb	0.01F 0.01M 0.01Mb	-	0.01F 0.01M 0.01Mb
Oxyfluorfen and metabolites	40 CFR 180.381	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb

1 Chickens only.

KEY

Ek:Excluding kidneys	M:Muscle
Et:Edible tissue	Mb:Meat byproducts
F:Fat	S:Skin
K:Kidney	St:Skin with fat
L:Liver	Sm:Skeletal muscle

RESIDUE LIMITS

Compound	Reference	Cattle	Sheep/ Goats	Swine	Poultry		Horses
			Units are parts per million				
Oxytetracycline	21 CFR 556.500	0.1Et	-	0.1Et	1F 3K 1L 1M 1S	-	
Paraquat	40 CFR 180.205	0.05F 0.3K 0.05M 0.05Mb	0.05F 0.3K 0.05M 0.05Mb	0.05F 0.3K 0.05M 0.05Mb	0.01F - 0.01M 0.01Mb	0.05F 0.3K 0.05M 0.05Mb	
PCB's ¹	21 CFR 109.30 46 FR 39224	3F ²	3F ²	3F ²	3F	3F ²	
Penicillin	21 CFR 556.510	0.05Et	0(0.04)Et	0(0.04)Et	0(0.04)Et ³	-	
Permethrin and metabolites	40 CFR 180.378	3.0F 0.25M 2.0Mb	3.0F 0.25M 2.0Mb	3.0F 0.12M 3.0Mb	0.15F 0.05M 0.25Mb	3.0F 0.25M 2.0Mb	
Phenothiazine	40 CFR 180.319 ⁴	2F 2M 2Mb	-	-	-	-	
Phorate and metabolites	40 CFR 180.206	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	
Phosalone	40 CFR 180.263	0.25F 0.25M 0.25Mb	0.25F 0.25M 0.25Mb	0.25F 0.25M 0.25Mb	-	0.25F 0.25M 0.25Mb	
Picloram	40 CFR 180.292	0.2F 5K 0.5L 0.2M 0.2Mb	0.2F 5K 0.5L 0.2M 0.2Mb	0.2F 5K 0.5L 0.2M 0.2Mb	0.05F 0.05M 0.05Mb	0.2F 5K 0.5L 0.2M 0.2Mb	

1 The processed product tolerance for residues of PCB's in infant and junior foods is 0.2 ppm [21 CFR 109.30(a)(8)].

2 Action level.

3 Chickens, pheasants, and quail; turkeys 0.01Et; ducks and geese 0.01Et (action level).

4 Interim tolerance.

KEY

Ek:Excluding kidneys
Et:Edible tissue
F:Fat
K:Kidney
L:Liver

M:Muscle
Mb:Meat byproducts
S:Skin
Sf:Skin with fat
Sm:Skeletal muscle

Compound	Reference	Cattle	Sheep/ Goats	Swine	RESIDUE LIMITS	
					Poultry	Horses
			Units are parts per million			
Piperonyl butoxide	40 CFR 180.127	0.1F	0.1F	0.1F	3F	0.1F
		0.1M	0.1M	0.1M	3M	0.1M
		0.1Mb	0.1Mb	0.1Mb	3Mb	0.1Mb
Pirimiphos- methyl and metabolites	40 CFR 180.409	0.2F	0.2F	0.2F	0.2F	0.2F
		2.0K	2.0K	2.0K	-	2.0K
		2.0L	2.0L	2.0L	-	2.0L
		0.2M	0.2M	0.2M	2.0M	0.2M
		0.2Mb	0.2Mb	0.2Mb	2.0Mb	0.2Mb
Profenofos and metabolites	40 CFR 180.404	0.05F	0.05F	0.05F	0.05F	0.05F
		0.05M	0.05M	0.05M	0.05M	0.05M
		0.05Mb	0.05Mb	0.05Mb	0.05Mb	0.05Mb
Profluralin	40 CFR 180.348	0.02F	0.02F	0.02F	0.02F	0.02F
		0.02M	0.02M	0.02M	0.02M	0.02M
		0.02Mb	0.02Mb	0.02Mb	0.02Mb	0.02Mb
Progesterone	21 CFR 556.540	12F ¹ 9K ¹ 6L ¹ 3M ¹	15F ² 15K ² 15L ² 3M ²	-	-	-
Propanil and metabolites	40 CFR 180.274	0.1F	0.1F	0.1F	0.1F	0.1F
		0.1M	0.1M	0.1M	0.1M	0.1M
		0.1Mb	0.1Mb	0.1Mb	0.1Mb	0.1Mb
Propargite	40 CFR 180.259	0.1F	0.1F	0.1F	0.1F	0.1F
		0.1M	0.1M	0.1M	0.1M	0.1M
		0.1Mb	0.1Mb	0.1Mb	0.1Mb	0.1Mb
Pyrantel tartrate	21 CFR 556.560	-	-	10K 10L 1M	-	-
Pyrethrins	40 CFR 180.128	0.1F	0.1F	0.1F	0.2F	0.1F
		0.1M	0.1M	0.1M	0.2M	0.1M
		0.1Mb	0.1Mb	0.1Mb	0.2Mb	0.1Mb
Quizalofop ethyl and metabolites	40 CFR 180.441	0.05F	0.05F	0.05F	0.05F	0.05F
		0.02M	0.02M	0.02M	0.02M	0.02M
		0.05Mb	0.05Mb	0.05Mb	0.05Mb	0.05Mb

1 Steers and calves (ppb);
above concentrations
naturally present.
2 Lambs (ppb); above
concentrations naturally
present.

KEY

Ek:Excluding kidneys	M:Muscle
Et:Edible tissue	Mb:Meat byproducts
F:Fat	S:Skin
K:Kidney	Sf:Skin with fat
L:Liver	Sm:Skeletal muscle

RESIDUE LIMITS

Compound	Reference	Cattle	Sheep/ Goats	Swine	Poultry		Horses
			Units are parts per million				
Robenidine hydrochloride	21 CFR 556.580	-	-	-	0.2F ¹ 0.2S ¹ 0.1Et ²	-	
Ronnel and metabolites	40 CFR 180.177	10F 4M 4Mb	10F 4M 4Mb	3F 2M 2Mb	0.01F 0.01M 0.01Mb	-	
Simazine	40 CFR 180.213	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb	
Sodium arsenite (as As ₂ O ₃)	40 CFR 180.335	0.7F 2.7K 2.7L 0.7M 0.7Mb	-	-	-	0.7F 2.7K 2.7L 0.7M 0.7Mb	
Sodium salt of acifluorfen and metabolites	40 CFR 180.383	0.02K 0.02L	0.02K 0.02L	0.02K 0.02L	0.02F 0.02M 0.02Mb	0.02K 0.02L	
Sodium sulfa-chloropyrazine monohydrate	21 CFR 556.625	-	-	-	0(0.1)Et ¹	-	
Spectinomycin	21 CFR 556.600	-	-	-	0.1Et ¹	-	
Streptomycin	21 CFR 556.610	- ³	-	0(0.5)Et ³	0(0.5)Et ³	-	
Sulfabromo-methazine sodium	21 CFR 556.620	0.1Et	-	-	-	-	
Sulfachlor-pyridazine	21 CFR 556.630	0.1Et ⁴	-	0.1Et	-	-	
Sulfadimethoxine	21 CFR 556.640	0.1Et	-	-	0.1Et	-	
Sulfaethoxy-pyridazine	21 CFR 556.650 MPI Dir. 917.1	0.1Et	-	0(0.1)Et	0.1Et ^{5,6}	-	

1 Chickens only.

2 Other than fat or skin (chickens only).

3 Administrative tolerance 2.0K.

4 Calves only.

5 Action level.

6 Turkeys only.

KEY

Ek:Excluding kidneys

Et:Edible tissue

F:Fat

K:Kidney

L:Liver

M:Muscle

Mb:Meat byproducts

S:Skin

Sf:Skin with fat

Sm:Skeletal muscle

Compound	Reference	Cattle	RESIDUE LIMITS			
			Sheep/ Goats	Swine	Poultry	Horses
			Units are parts per million			
Sulfamethazine	21 CFR 556.670	0.1Et	-	0.1Et	0.1Et ¹	-
Sulfanitran and metabolites	21 CFR 556.680	-	-	-	0(0.1)Et ²	-
Sulfathiazole	21 CFR 556.690	-	-	0.1Et	-	-
Sulfomycin	21 CFR 556.700	-	-	-	0(0.1)Et	-
Tebuthiuron and metabolites	40 CFR 180.390	2F 2M 2Mb	2F 2M 2Mb	-	-	2F 2M 2Mb
Terbacil and metabolites	40 CFR 180.209	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	-	0.1F 0.1M 0.1Mb
Testosterone propionate	21 CFR 556.710	2.6F ³ 1.9K ³ 1.3L ³ 0.64M ³	-	-	-	-
Tetracycline	21 CFR 556.720	0.25Et ⁴	0.25Et	0.25Et	0.25Et	-
Tetradifon	40 CFR 180.174	0M	0M	0M	0M	0M
Thiabendazole and metabolite	21 CFR 556.730 40 CFR 180.242	0.1Et 0.1F 0.1M 0.1Mb	0.1Et 0.1F 0.1M 0.1Mb	0.1Et 0.1F 0.1M 0.1Mb	- 0.1F 0.1M 0.1Mb	0.1Et 0.1F 0.1M 0.1Mb
Thidiazuron and metabolites	40 CFR 180.403	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb
Thiobencarb and metabolites	40 CFR 180.401	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb

1 Chickens and turkeys only.

2 Chickens only.

3 Heifers only, (ppb) above concentrations naturally present

4 Calves only.

KEY

Ek:Excluding kidneys

Et:Edible tissue

F:Fat

K:Kidney

L:Liver

M:Muscle

Mb:Meat byproducts

S:Skin

Sf:Skin with fat

Sm:Skeletal muscle

RESIDUE LIMITS

Compound	Reference	Cattle	Sheep/ Goats	Swine	Poultry	Horses
			Units are parts per million			
Thiophanate-methyl and metabolites	40 CFR 180.371	0.1F	0.1F	0.1F	0.1F	0.1F
		0.2K	0.2K	1.0L	0.2L	1.0L
		2.5L	2.5L	0.1M	0.1M	0.1M
		0.1M	0.1M	0.1Mb	0.1Mb	0.1Mb
		0.1Mb	0.1Mb	0.05Mb		0.05Mb
Tiamulin	21 CFR 556.738	-	-	0.4L ¹	-	-
Toxaphene	40 CFR 180.138 MPI Dir. 917.1	7F	7F	7F	7F ²	7F
Trenbolone	21 CFR 556.739	- ³	-	-	-	-
Triasulfuron ⁴	54 FR 18020	0.05F	0.05F	0.05F	-	0.05F
		0.5K	0.5K	0.5K		0.5K
		0.1L	0.1L	0.1L		0.1L
		0.05M	0.05M	0.05M		0.05M\
S, S, S-Tributyl-phosphoro-trithioate	40 CFR 180.272	0.02F	0.02F	-	-	-
		0.02M	0.02M			
		0.02Mb	0.02Mb			
Trichlorfon	40 CFR 180.198	0.1F	0.1F	-	-	0.1F
		0.1M	0.1M			0.1M
		0.1Mb	0.1Mb			0.1Mb
Triclopyr and metabolites	40 CFR 180.417	0.05F	0.05F	0.05F	0.2F ⁵	0.05F
		0.5K	0.5K	0.5K	1.0K ⁵	0.5K
		0.5L	0.5L	0.5L	0.2L ⁵	0.5L
		0.05M	0.05M	0.05M	0.2M ⁵	0.05M
		0.05Mb	0.05Mb	0.05Mb	0.2Mb ⁵	0.05Mb
Triphenyltin hydroxide	40 CFR 180.236	0.05K	0.05K	0.05K	-	0.05K
		0.05L	0.05L	0.05L		0.05L
Tylosin	21 CFR 556.740	0.2F	-	0.2F	0.2F	-
		0.2K		0.2K	0.2K	
		0.2L		0.2L	0.2L	
		0.2M		0.2M	0.2M	

1 Tolerance for 8-a-hydroxy-mutilin; corresponds to 10.8 total residues in liver.

2 Action level.

3 Tolerance not needed.

4 Tolerances established until December 31, 1990.

5 Tolerances established until July 11, 1990.

KEY

Ek:Excluding kidneys

Et:Edible tissue

F:Fat

K:Kidney

L:Liver

M:Muscle

Mb:Meat byproducts

S:Skin

Sf:Skin with fat

Sm:Skeletal muscle

Compound	Reference	Cattle	Sheep/ Goats	Swine	RESIDUE LIMITS	
					Poultry	Horses
			Units are parts per million			
Virginiamycin	21 CFR 556.750	-	-	0.4F 0.4K 0.3L 0.1M 0.4S	0.2F ¹ 0.5K ¹ 0.3L ¹ 0.1M ¹ 0.2S ¹	-
Zeranol	21 CFR 556.760	- ²	0(0.020)Et ³	-	-	-
Zinc ion & maneb, coordi- nation product	40 CFR 180.176	0.5K 0.5L	0.5K 0.5L	0.5K 0.5L	0.5K 0.5L	0.5K 0.5L
Zoalene and metabolite	21 CFR 556.770	-	-	-	2F ⁴ 6K ⁴ 6L ⁴ 3M ⁴	-

1 Broiler chickens only.

2 Approved; tolerance unnecessary.

3 Sheep only.

4 Chickens only;

turkeys: 3L, 3M.

KEY

Ek:Excluding kidneys

Et:Edible tissue

F:Fat

K:Kidney

L:Liver

M:Muscle

Mb:Meat byproducts

S:Skin

Sf:Skin with fat

Sm:Skeletal muscle

Section 3

Introduction

The Food Safety and Inspection Service (FSIS) requires practical analytical methods for detecting, quantifying, and identifying all residues that may be present in meat, poultry, and their processed products at levels above established safe residue limits. These methods can be used by the Agency for monitoring and surveillance activities to determine whether product is adulterated. The Agency uses available methodology to take appropriate regulatory action against adulterated products, consistent with the reliability of the analytical data. However, because of the large number of potential residues that may occur in the food chain, practical methods are not available for many compounds of interest. This section describes the types of methods used by FSIS to conduct analyses (as of July 1, 1989) and their suitability for regulatory use. A list of key terms precedes the method descriptions.

Method Levels

Methods are described in terms of levels of use:

Level I--These are assays with the highest level of credibility. They are unequivocal at the level of interest. They may be single procedures that determine both the concentration and the identity of the analyte, or combinations of determinative methods for concentration and confirmatory methods for definitive identification.

Level II--These are assays that are not unequivocal but are used to determine the concentration of an analyte at the level of interest and to provide some structural information. These methods are reliable enough to be used as reference methods.

Level III--These are screening methods that may generate limited though useful information. These tests detect the presence or absence of a compound or a class of compounds at some concentration level of interest. They are used because of a greater throughput, portability, or convenience than the Level I or Level II methods. The level of reliability has been determined and documented. The hallmark of Level III tests is that action based on individual positive results requires substantiation based on Level I or Level II methods, as required by the uncertainty of any individual results.

Methods are further classified according to their status. Within each classification, subgroups are defined according to the extent to which a method was subjected to study. Therefore, whether (or how well) a specific analytical method meets a defined suitability criterion determines its classification and subgroup.

Criteria for Practical Methods

The following criteria have been identified as guidelines for methods suitable for regulatory use.

1. The method requires no more than 2-4 hours of analytical time per sample.
2. The method requires no instrumentation not customarily available in a laboratory devoted to trace drug or environmental analysis.
3. Chemical methods have a Minimum Proficiency Level (MPL) at or below the established residue limit and antimicrobial methods have a Minimum Inhibitory Concentration (MIC) at or below the established residue limit.

4. A quality assurance plan (QAP) has been developed for the method.
5. The method has been subjected successfully to an interlaboratory study at 0, 1/2 X, X, and 2X, where X is the analyte concentration at the residue limit. FSIS considers the methods described for "zero tolerance" compounds to be suitable for regulatory use if they meet the suitability criteria listed above and have an MPL or MIC at the operational definition of zero defined by FDA or EPA. Methods determined to be suitable for regulatory use except for criterion 3 or 5 will be marked with an asterisk (*). In an emergency situation, exceptions to a method's suitability may be necessary.

Method Status

The method status classifications are:

A. AOAC Official Methods. Such methods have been subjected to an interlaboratory study in which five or more laboratories participated. If this collaborative process provides results that establish acceptability, the methods are accepted as official methods by the AOAC. Some AOAC official methods have been subsequently studied for extension as follows:

1. Extension to other analytes, tissues, species, and products by a three-analyst (two or three laboratory) study--a validation study.
2. Extension by a one or two analyst intralaboratory or interlaboratory study as follows:
 - a. Extended to other tissues, species, and products for the initial analyte(s) studied.
 - b. Extended to other similar analytes in the same matrices as initially studied.

B. Validated Methods. Methods subjected to an interlaboratory study in two or three laboratories with a minimum of three independent analysts. The resulting data are reviewed by a peer group of government scientists. The data that result from the study are made available for review upon request. Included in this category would be post-1973 New Animal Drug Application (NADA) methods developed by sponsors that have been successfully studied by FSIS and FDA laboratories. Some validated methods have been subsequently studied for extension by a single or two analyst intralaboratory or interlaboratory study as follows:

1. Extended to other tissues, species, and products for the initial analyte(s) studied.
2. Extended to other similar analytes for the initial tissues/species and products studied.

C. Federal Register Methods. Methods of analysis published in the Federal Register and later incorporated into the Code of Federal Regulations.

D. Historical Official Methods. Methods that were considered to be the best available at the time of initial acceptance and have continued in use over an extended period in the absence of a more effective method. Included in this category would be pre-1974 NADA methods that were submitted by sponsors and accepted by FDA and FSIS without a multilaboratory study.

E. Nonvalidated Methods (NVM). Methods for quantification and/or confirmation that have not been subjected to a multilaboratory study of at least three independent analysts; or, analytical methods that have been subjected to a multilaboratory study but do not meet either criterion 3 or 5 of the criteria for methods suitable for routine use.

F. Published Methods. These methods have been subjected to a study by a single analyst or laboratory when the data for evaluation are limited. However, a quality control plan will be in place. The results are reviewed by a peer group of government scientists.

G. Correlated Methods. These methods have not been validated by traditional interlaboratory study, but data obtained from use of the method have been correlated and/or compared with data obtained from use of a method for regulatory enforcement. The same samples must be used for this comparison, and the data must be reviewed by a peer group of government scientists.

KEY TERMS

AAS -- Atomic absorption spectrometry

AOAC -- Association of Official Analytical Chemists

CELIA CA -- Competitive Enzyme Labeled Immunoassay for Chloramphenicol: a laboratory test that detects and identifies chloramphenicol residues in cattle and pork muscle

EC -- Electron capture

EI -- Electron impact

E-Z Screen -- A proprietary immunoassay system for rapidly detecting and identifying various antibiotics and other residues in tissue extracts

GC -- Gas chromatography

GLC -- Gas liquid chromatography

GPC -- Gel permeation chromatography

HFB -- heptafluorobutyl[imidazole]

HPLC -- High pressure liquid chromatography

JAOAC -- Journal of the Association of Official Analytical Chemists

J. Food Prot. -- Journal of Food Protection

LDL -- Lowest detectable limit: the smallest amount of individual residue or sample component that can be reliably observed or found in the sample matrix by the current appropriate methodology

Method Status -- See discussion above

MIC -- Minimum inhibitory concentration: the minimum level of antimicrobial compound present in a buffer extract of tissue that will inhibit bacterial growth

MPL -- Minimum proficiency level: the minimum amount of analyte expected to be identified and quantified by a laboratory and upon which ongoing capability will be evaluated. It is the smallest concentration for which the predicted coefficient of variation for reproducibility (CV) is less than or equal to 20 percent and the upper 90 percent confidence level for the predicted CV is less than 30 percent.

KEY TERMS

MS -- Mass spectrometry

NADA -- New Animal Drug Application, issued by the Food and Drug Administration (FDA)

NE -- Level not established

NICI -- Negative ion chemical ionization

PICI -- Positive ion chemical ionization

PP -- Processed product

Quantification -- The determination of the amount of residue present in a sample

Reference Methods -- Analytical procedures by which other methods may be evaluated and for which performance standards are established. These methods are considered suitable for regulatory use in the National Residue Monitoring Program.

Residue -- Any compound present in edible tissues of the target animal that results from that compound's use or inadvertent introduction into the animal. "Residue" includes the compound itself, its metabolites, and other substances formed in or on food because of the compound's use or inadvertent introduction.

SOS -- Sulfa-on-Site: a rapid in-plant chemical screening test for detecting sulfonamide residues in food animal urine or serum that provides same-day results

STOP -- Swab Test on Premises: an overnight in-plant microbiological screen test for detecting antibiotic residues in edible tissues

Swab -- STOP precursor: an overnight laboratory microbiological screen test for detecting antibiotic residues in edible tissues

TLC -- Thin layer chromatography

UV -- Ultraviolet spectrophotometric technique for detection and quantification

FSIS RESIDUE ANALYTICAL CAPABILITY

Compound	Description	TEST METHOD			Species/ Tissues	Reference
		LDL/ MIC	MPL	Level/ Status		
Albendazole (amino sulfone metabolite)	Marker residue detected and quantified by HPLC- fluorescence detection	20 ppb	50 ppb	IIB IIB-1	Cattle/liver Cattle/muscle Sheep/muscle liver	Sec. 5.034 FSIS Chemistry Lab Guidebook
	Extracts from HPLC confirmed by GC-MS	20 ppb	50 ppb	IB IB-1	Cattle/liver Cattle/muscle Sheep/muscle liver	Sec. 5.034 FSIS Chemistry Lab Guidebook
	pH extraction with organic solvents followed by HPLC with UV detection; extracts derivatized and confirmed by GC/EI/MS	0.05 ppm	NE	IIE IE	Red meat liver muscle	Copy available upon request
Aldicarb and metabolites	GPC plus HPLC with post- column fluorescence detection; extracts verified by oxidation to the sulfone	5 ppb	10 ppb	IIE IE	All/liver	Copy available upon request
	Micro alumina assay: column chromatography plus GLC	0.02 ppm	NE	IIE	All/fat pp	Sec. 5.002 FSIS Chemistry Lab Guidebook
Aldrin	GPC plus GLC	0.02 ppm	0.05 ppm	IIA	All/fat	Sec. 5.003 FSIS Chemistry Lab Guidebook
	Mills method: Florisil column chromatography plus GLC	0.02 ppm	0.10 ppm	IIB	All/fat pp	Sec. 5.001 FSIS Chemistry Lab Guidebook

FSIS RESIDUE ANALYTICAL CAPABILITY

Compound	Description	TEST METHOD			Species/ Tissues	Reference
		LDL/ MIC	MPL	Level/ Status		
Aldrin, continued	Extracts from GPC or Mills confirmed by GC/MS	0.02 ppm	NE	IE (GPC/MS) IF (Mills/MS)	All/fat pp	Sec. 5.004 FSIS Chemistry Lab Guidebook
Amoxicillin trihydrate	Microbiological assay procedure: ability of tissue extracts containing antimicrobial activity to inhibit microbial growth	0.02 ppm	0.02 ppm	IIB	Cattle, swine kidney liver muscle	NADA 55-080 & 55-089 Beecham
Ampicillin	Tissue extracts quanti- fied by HPLC using fluorometer	0.01 ppm	0.01 ppm	IIB	Cattle, swine kidney liver muscle	Sec. 5.048 FSIS Chemistry Lab Guidebook
Ampicillin trihydrate	Microbiological assay procedure: ability of tissue extracts containing antimicrobial activity to inhibit microbial growth	0.01 ppm	0.01 ppm	IIB	Cattle, swine all	NADA 55-030 Squibb
Apramycin	Sample extraction TLC; bioautographed using Bacillus subtilis as a test organism	0.05 ppm	0.1 ppm	IIB	Swine/kidney muscle	Sec. 5.047 FSIS Chemistry Lab Guidebook

FSIS RESIDUE ANALYTICAL CAPABILITY

Compound	Description	TEST METHOD			Species/ Tissues	Reference
		LDL/ MIC	MPL	Level/ Status		
Arsanilate sodium Arsanilic acid Arsenate, Calcium Arsenate, Copper Arsenate, Lead Arsenate, Magnesium Arsenate, Sodium Arsenic Arsenite, Potassium Arsenite, Sodium	Dry ashed tissue dissolved and reacted to produce arsine gas, which is quantified by AAS	0.05 ppm	NE	IE	All/kidney liver muscle	Sec. 5.009 FSIS Chemistry Lab Guidebook
	Dry ashed tissue dissolved and reacted to produce arsine gas, which reacts to form blue complex for colorimetric quantification	0.05 ppm	0.20 ppm	IIA	All/kidney liver muscle	AOAC Book of Methods 14th Edit., 25.050
Atrazine	Fat extracted using C18 columns and quantified by capillary GC with nitrogen/phosphorous detector	5 ppb	NE	IIIE	All/fat	Copy available upon request
	Extracts confirmed by GC/MS	5 ppb	NE	IE	All/fat	Sec. 5.032 FSIS Chemistry Lab Guidebook
Bacitracin methylene disalicylate Bacitracin, zinc	Microbiological assay procedure: ability of tissue extracts containing antimicrobial activity to inhibit microbial growth	0.05 ppm	NE	IID	All/kidney liver muscle	Kramer et al. FDA 1974
Bambermycins	Microbiological assay procedure: ability of tissue extracts containing antimicrobial activity to inhibit microbial growth	25 ppb	NE	IID	All/kidney liver muscle	NADA 44-759 Hoechst

Compound	Description	TEST METHOD			Species/ Tissues	Reference
		LDL/ MIC	MPL	Level/ Status		
Benomyl	pH extraction with organic solvents; followed by HPLC with UV detection; extracts derivatized and confirmed by GC/EI/MS	0.05 ppm	NE	IIE	Poultry/liver muscle	Copy available upon request
	Micro alumina assay: column chromatography plus GLC	0.01 ppm	NE	IIE	All/fat pp	Sec. 5.002 FSIS Chemistry Lab Guidebook
	GPC plus GLC	0.01 ppm	0.05 ppm	IIA	All/fat	Sec. 5.003 FSIS Chemistry Lab Guidebook
BHC	Beta and delta isomers: GPC plus GLC	0.02 ppm	0.05 ppm	IIA-2b	All/fat	Sec. 5.003 FSIS Chemistry Lab Guidebook
	Mills method: Florisil column chromatography plus GLC	0.02 ppm	0.10 ppm	IIB	All/fat pp	Sec. 5.001 FSIS Chemistry Lab Guidebook
	Extracts from GPC or Mills confirmed by GC/MS	0.02 ppm	NE	IE (GPC/MS) IF (Mills/MS)	All/fat pp	Sec. 5.004 FSIS Chemistry Lab Guidebook
Bufencarb	GPC plus HPLC with post-column fluorescence detection. Extracts are subjected to reverse phase chromatography, derivatized and confirmed by GC/MS	5 ppb	10 ppb	IIE	All/liver IE	Copy available upon request

FSIS RESIDUE ANALYTICAL CAPABILITY

Compound	Description	TEST METHOD			Species/ Tissues	Reference
		LDL/ MIC	MPL	Level/ Status		
Buquinolate	Zymark Pytechnology System: tissue extracts screened by HPLC/UV	NE	NE	IIIE	Cattle/liver muscle	Copy available upon request
Cacodylic acid	Dry ashed tissue is dissolved and reacted to produce arsine gas, which is quantified by AAS	0.05 ppm	NE	IE	All/kidney liver muscle	Sec. 5.009 FSIS Chemistry Lab Guidebook
	Dry ashed tissue is dissolved and reacted to produce arsine gas, which reacts to form blue complex for colorimetric quantification		0.05 ppm	0.20	IIA liver muscle	All/kidneyAOAC Book of Methods, 14th Edit., 25.050
Cadmium	Dry ashed tissue is dissolved and quantified by AAS	0.10 ppm	0.30 ppm	IB	All/kidney liver muscle	Sec. 5.010 FSIS Chemistry Lab Guidebook
	Dry ashed tissue is dissolved and quantified by inductively coupled plasma (ICP)	NE	1.67 ppb	IE	All/kidney liver muscle	Copy available upon request
	Dry ashed tissue is quantified by anodic stripping voltammetry	1.0 ppb	NE	IF	Poultry kidney liver	JAOAC, 60, 4, 826-832(1977)
Calcium	Tissue is wet ashed and titrated with specific indicator	0.03%	0.03%	IIA	All/muscle	AOAC Book of Methods, 14th Edit., 24.062
	Wet ashed tissue is quantified by AAS	NE	NE	IE	All	Sec. 6.008 FSIS Chemistry Lab Guidebook

Compound	Description	LDL/ MIC	TEST METHOD		Species/ Tissues	Reference
			MPL	Level/ Status		
Cambendazole	Extraction with organic solvents followed by HPLC with UV detection; extracts confirmed by GC/EI/MS	0.05 ppm	NE	IIE	Red meat liver muscle pp	Copy available upon request
Captan	GPC plus GLC	0.02 ppm	0.05 ppm	IIA-2b	Red meat/fat	Sec. 5.003 FSIS Chemistry Lab Guidebook
Carbadox	Tissue extract is hydrolyzed and a derivative is prepared and separated by preparative TLC, quantified by GLC	7.5 ppb	30 ppb	IIB	Swine liver muscle	Sec. 5.014 FSIS Chemistry Lab Guidebook
Carbarsone	Extracts confirmed by GC/EI/MS	7.5 ppb	NE	IE	Swine liver muscle	Copy available upon request
	Dry ashed tissue is dissolved and reacted to produce arsine gas, which is quantified by AAS	0.05 ppm	NE	IE	All/kidney liver muscle	Sec. 5.009 FSIS Chemistry Lab Guidebook
Carbaryl	Dry ashed tissue is dissolved and reacted to produce arsine gas, which reacts to form blue complex for colorimetric quantification	0.05 ppm	0.20 ppm	IIA	All/kidney liver muscle	AOAC Book of Methods, 14th Edit., 25.050
	GPC plus HPLC with post-column fluorescence detection. Extracts are subjected to reverse phase chromatography, derivatized and confirmed by GC/MS	5 ppb	10 ppb	IIE	All/liver IE	Copy available upon request

FSIS RESIDUE ANALYTICAL CAPABILITY

Compound	Description	TEST METHOD			Species/ Tissues	Reference
		LDL/ MIC	MPL	Level/ Status		
Carbofuran and metabolite	GPC plus HPLC with post- column fluorescence detection Extracts are subjected to reverse phase chromatography, deriva- tized and confirmed by GC/MS	5 ppb	10 ppb	IIE	All/liver	Copy available upon request
					IE	
Carbophenothion	Tissue extracts are quantified by GLC with flame photometric or nitrogen-phosphorous flame ionization detector	0.10 ppm	NE	IIB	All/liver muscle	Sec. 5.006 FSIS Chemistry Lab Guidebook
	GPC plus GLC	0.03 ppm	0.20 ppm	IIA-2b	All/fat	Sec. 5.003 FSIS Chemistry Lab Guidebook
	GPC extracts are confirmed by CG/EI/MS	0.01 ppm	NE	IE	Red meat/fat	To be added to Sec. 5.004 FSIS Chemistry Lab Guidebook
Chloramphenicol	Tissue extracts are screened by E-Z screen	25 ppb	NE	IIIE	Cattle, swine muscle kidney	Environmental Diagnostics
Chloramphenicol palmitate	Tissue extract screened for chloramphenicol by CELIA CA	5 ppb	NE	IIE	Cattle, swine muscle	Antimic.Ag. Chemo., 25, 2, 205-211(1984)
	Extraction of parent and glucuronide using C18 columns with GC capillary quantification as the trimethylsilyl derivative	0.15 ppb	NE	IIE	Cattle, swine muscle	Copy available upon request-- Replaces Sec. 5.022

Compound	Description	TEST METHOD			Species/ Tissues	Reference
		LDL/ MIC	MPL	Level/ Status		
Chloramphenicol and chloramphenicol palmitate, continued	Extracts are confirmed using NICI/MS	0.15 ppb	NE	IE	Cattle, swine muscle pp	Sec. 5.023 FSIS Chemistry Lab Guidebook; amended criteria available upon request
	C18 cleanup of the hydrolyzed extract with GC capillary quantification as the trimethyl derivative	5 ppb	NE	IIE	Cattle/urine	Copy available upon request
	Extracts are confirmed using NICI/MS	5 ppb	NE	IE	Cattle/urine	Sec. 5.023 FSIS Chemistry Lab Guidebook; amended criteria available upon request
Chlordane (cis & trans)						
	column chromatography plus GLC	Micro alumina assay: ppm		0.15	NE	IIEAll/fat ppSec. 5.002 FSIS Chemistry Lab Guidebook
	GPC plus GLC	0.10 ppm	0.30 ppm	IIA	All/fat	Sec. 5.003 FSIS Chemistry Lab Guidebook
	Mills method: Florisil column chromatography plus GLC	0.15 ppm	0.30 ppm	IIIB	All/fat pp	Sec. 5.001 FSIS Chemistry Lab Guidebook
	Extracts from GPC or Mills are confirmed by GC/MS	0.10 ppm	NE	IE (GPC/MS) IF (Mills/MS)	All/fat pp	Sec. 5.004 FSIS Chemistry Lab Guidebook

FSIS RESIDUE ANALYTICAL CAPABILITY

Compound	Description	TEST METHOD			Species/ Tissues	Reference
		LDL/ MIC	MPL	Level/ Status		
Chlordecone	GPC plus GLC	0.03 ppm	0.20 ppm	IIA-2b	All/fat	Sec. 5.003 FSIS Chemistry Lab Guidebook
	GPC extracts are confirmed by GC/EI/MS	0.05 ppm (poultry) 0.20 ppm (cattle)	NE	IE	Poultry, red meat fat	To be added to Sec. 5.004 FSIS Chemistry Lab Guidebook
2-Chloro-1-(2,4-di- chlorophenyl) vinyl diethyl phosphate	GPC plus GLC	0.03 ppm	0.10 ppm	IIA-2b	Cattle, sheep/fat	Sec. 5.003 FSIS Chemistry Lab Guidebook
	GPC extracts are confirmed by CG/EI/MS	0.01 ppm (poultry) 0.10 ppm (red meat)	NE	IE	Poultry, red meat fat	To be added to Sec. 5.004 FSIS Chemistry Lab Guidebook
2-Chloro-1-(2,4,5-tri- chlorophenyl) vinyl dimethyl phosphate	Tissue extracts are quantified by GLC with flame photometric or nitrogen- phosphorous flame ionization detector	NE	NE	IIIE	All/liver muscle	Sec. 5.006 FSIS Chemistry Lab Guidebook
	GPC plus GLC	0.05 ppm	0.30 ppm	IIA-2b	All/fat	Sec. 5.003 FSIS Chemistry Lab Guidebook

Compound	Description	TEST METHOD			Species/ Tissues	Reference
		LDL/ MIC	MPL	Level/ Status		
2-Chloro-1-(2,4,5-tri-chlorophenyl) vinyl dimethyl phosphate, continued	GPC extracts are confirmed by GC/EI/MS	0.05 ppm (poultry) 0.10 ppm (cattle)	NE	IE	Poultry, red meat fat	To be added to Sec. 5.004 FSIS Chemistry Lab Guidebook
Chlorpyrifos	Tissue extracts are quantified by GLC with muscle flame photometric or nitrogen- phosphorous flame ionization detector	NE	NE	IIB	All/liver	Sec. 5.006 FSIS Chemistry Lab Guidebook
	GPC plus GLC	0.05 ppm	0.20 ppm	IIA-2b	All/fat	Sec. 5.003 FSIS Chemistry Lab Guidebook
	GPC extracts are confirmed by GC/EI/MS	0.02 ppm (poultry) 0.10 ppm (swine)	NE	IE	Poultry, red meat fat	To be added to Sec. 5.004 FSIS Chemistry Lab Guidebook
Chlortetracycline bisulfate	Antibiotic screen test (Swab): ability of tissue fluids containing antimicrobial activity to inhibit microbial growth	0.01 ppm	NE	IIIE	All/kidney	J. Food Prot., 1981, 44, 828-831
Chlortetracycline hydrochloride	Microbiological assay pro- cedure: ability of tissue extracts containing antimicrobial activity to inhibit microbial growth	0.01 ppm	NE	IID	All/kidney liver muscle	Sec. 6.312 FSIS Microbiology Lab Guidebook

FSIS RESIDUE ANALYTICAL CAPABILITY

Compound	Description	TEST METHOD			Species/ Tissues	Reference
		LDL/ MIC	MPL	Level/ Status		
Chlortetracycline bisulfate and chlortetracycline hydrochloride, continued	Tissue extraction of parent drug is converted to anhydro derivative for identification by TLC	0.1 ppm	NE	IIE	All/kidney liver muscle	Copy available upon request
Chromium	Dry ashed tissue is extracted with organic reagent and quantified using AAS	NE	NE	IE	All/kidney liver muscle	Sec. 5.010 FSIS Chemistry Lab Guidebook
Clopidol	Organic solvent extrac- tion with HPLC-UV detection	0.1 ppm	NE	IIE	Poultry/liver	JAOAC, 67, 2, 334-336 (1984)
	Organic solvent extrac- tion with GC-EC detection	0.1 ppm	NE	IIA	Poultry/liver	AOAC Book of Methods, 14th Edit., 41.013.
Clorsulon	Tissue extracts are quantified by HPLC-UV detection	0.25 ppm	0.50 ppm	IIB	Red meat kidney muscle liver pp	Sec. 5.045 FSIS Chemistry Lab Guidebook
	Tissue extracts for HPLC are derivatized and con- firmed by GC/MS	0.5 ppm	NE	IB	Red meat kidney muscle liver pp	Sec. 5.045 FSIS Chemistry Lab Guidebook
Cloxacillin, Benzathine	Antibiotic screen test	0.16 ppm	NE	IIIE	All/kidney	J. Food Prot., 1981, 44, 828-831
Cloxacillin, Sodium	(Swab): ability of tissue fluids containing anti- microbial activity to inhibit microbial growth					

FSIS RESIDUE ANALYTICAL CAPABILITY

Compound	Description	TEST METHOD			Species/ Tissues	Reference
		LDL/ MIC	MPL	Level/ Status		
Cloxacillin, Benzathine Cloxacillin, Sodium, continued	Microbiological assay combined with HPLC separation and quantified by microbial inhibition	0.02 ppm	NE	IIF	Dairy cows kidney liver muscle	NADA 55-069 Beecham- Masengill
Cobalt	Dry ashed tissue is dis- solved and quantified using AAS	0.20 ppm	NE	IB	All/kidney liver muscle	Sec. 5.010 FSIS Chemistry Lab Guidebook
Copper	Dry ashed tissue is dissolved and quantified by inductively coupled plasma (ICP)	NE	0.34 ppb	IE	All/kidney liver muscle	Copy available upon request
	Dry ashed tissue is dis- solved and quantified using AAS	0.50 ppm	NE	IB	All/kidney liver muscle	Sec. 5.010 FSIS Chemistry Lab Guidebook
	Dry ashed tissue is dissolved and quantified by inductively coupled plasma (ICP)	NE	0.67 ppb	IE	All/kidney liver muscle	Copy available upon request
Coumaphos	Tissue extracts are quantified by 0.10 GLC with flame photometric or nitrogen-phosphorous flame ionization detector	0.15 ppm	NE	IIE	All/liver muscle	Sec. 5.006 FSIS Chemistry Lab Guidebook
	GPC plus GLC					
	GPC extracts are confirmed by CG/EI/MS					
		0.30 ppm	0.30 ppm	IE	All/fat	Sec. 5.003 FSIS Chemistry Lab Guidebook
		0.10 ppm	0.30 ppm	IE	Red meat/fat	To be added to Sec. 5.004 FSIS Chemistry Lab Guidebook

FSIS RESIDUE ANALYTICAL CAPABILITY

Compound	Description	TEST METHOD			Species/ Tissues	Reference
		LDL/ MIC	MPL	Level/ Status		
Coumaphos, oxygen analog of	Tissue extracts are quantified by GLC with flame photometric or nitrogen-phosphorous flame ionization detector	NE	NE	IIIE	All/liver muscle	Sec. 5.006 FSIS Chemistry Lab Guidebook
	GPC plus GLC	0.15 ppm	0.30 ppm	IIA-2b	All/fat	Sec. 5.003 FSIS Chemistry Lab Guidebook
Cresylic acid	GPC extracts are confirmed by CG/EI/MS	0.10 ppm	NE	IE	Red meat/fat	To be added to Sec. 5.004 FSIS Chemistry Lab Guidebook
	Tissue extracts are derivatized and determined by GC-EC	NE	NE	IIIE	Poultry/fat	Sec. 5.036 FSIS Chemistry Lab Guidebook
Cruformate	Tissue extracts are quantified by GLC with flame photometric or nitrogen-phosphorous flame ionization detector	0.10 ppm	NE	IIIB	All/liver muscle	Sec. 5.006 FSIS Chemistry Lab Guidebook
Cyanide salts	Aqueous extraction followed by a colorimetric determination	0.5 ppm	NE	IIIE	All/all	Sec. 5.038 FSIS Chemistry Lab Guidebook
	For confirmation, cyanogen chloride is produced and determined by GC/EC	0.5 ppm	NE	IE	All/all	Sec. 5.038 FSIS Chemistry Lab Guidebook

Compound	Description	LDL/ MIC	TEST METHOD		Species/ Tissues	Reference
			MPL	Level/ Status		
Cyano (3-phenoxy-chlorophenyl) methyl-4-a-(methylethyl) benzeneacetate	Organic solvent extracts are isomers by GC/EC; extracts are confirmed by GC/EI/MS	25 quantified as the sum of both	NE	IIE IE	All/fat ppb	Copy available upon request
Cypermethrin	Organic solvent extracts are quantified as the sum of three isomers by GC/EC; extracts are confirmed by GC/EI/MS	0.025 ppm	NE	IIE IE	All/fat	Copy available upon request
Cyromazine and melamine metabolite	Tissue extracts are quantified by HPLC-UV detection	0.05 ppm	0.25 ppm	IIB IIB-1	Poultry muscle pp Red meat muscle pp	Sec. 5.037 ¹ FSIS Chemistry Lab Guidebook
	Extracts are used to confirm cyromazine and melamine residues by GC/EI/MS using polymethylsilyl derivative	0.05 ppm	NE	IE	All/muscle	Copy available upon request
DDE (metabolites of DDT collectively reported as DDT)	Micro alumina assay: column chromatography plus GLC GPC plus GLC	0.02 ppm 0.02 ppm	NE 0.05 ppm	IIE IIA	All/fat pp All/fat	Sec. 5.002 FSIS Chemistry Lab Guidebook Sec. 5.003 FSIS Chemistry Lab Guidebook

¹ Method validated at 0.4 ppm for cyromazine and 0.1 ppm for melamine, reevaluated at 0.05 ppm in poultry and red meats to meet new tolerance.

FSIS RESIDUE ANALYTICAL CAPABILITY

Compound	Description	TEST METHOD			Species/ Tissues	Reference
		LDL/ MIC	MPL	Level/ Status		
DDE, continued	Mills method: Florisil column chromatography plus GLC	0.02 ppm	0.10 ppm	IIB	All/fat pp	Sec. 5.001 FSIS Chemistry Lab Guidebook
	Extracts from GPC or Mills are confirmed by GC/MS	0.02 ppm	NE	IE (GPC/MS) IF (Mills/MS)	All/fat pp	Sec. 5.004 FSIS Chemistry Lab Guidebook
DDT (isomers of DDT collectively reported as DDT)	Micro alumina assay: column chromatography plus GLC	0.04 ppm	NE	IIE	All/fat pp	Sec. 5.002 FSIS Chemistry Lab Guidebook
	GPC plus GLC	0.04 ppm	0.15 ppm	IIA	All/fat	Sec. 5.003 FSIS Chemistry Lab Guidebook
	Mills method: Florisil column chromatography plus GLC	0.04 ppm	0.15 ppm	IIB	All/fat pp	Sec. 5.001 FSIS Chemistry Lab Guidebook
Decoquinat	Zymark Pytechnolgy System; organic solvent extraction followed by HPLC with fluorescence detection	0.20 ppm	0.5 ppm	IIB-2	Cattle, poultry liver muscle	Copy available upon request
Deltamethrin	Organic solvent extracts are quantified by GC/EC; extracts are confirmed by GC/EI/MS	0.025 ppm	NE	IIE	All/fat	Copy available upon request
				IE		

Compound	Description	TEST METHOD			Species/ Tissues	Reference
		LDL/ MIC	MPL	Level/ Status		
Diazinon	Tissue extracts are quantified by GLC with flame photometric or nitrogen-phosphorous flame ionization detector	0.1 ppm	NE	IIB	All/liver muscle	Sec. 5.006 FSIS Chemistry Lab Guidebook
Dibutyltin dilaurate	Tissue extraction acidhydrolysis--morin derivatization--HPLC-UV	0.25 ppm	NE	IE (with AA for tin)	Turkey/liver	Copy available upon request
Dichlorvos	Tissue extracts are quantified by GLC with flame photometric or nitrogen-phosphorous flame ionization detector	NE	NE	IIA	All/liver muscle	Sec. 5.006 FSIS Chemistry Lab Guidebook
Dieldrin	Micro alumina assay: column chromatography plus GLC	0.01 ppm	NE	IIE	All/fat pp	Sec. 5.002 FSIS Chemistry Lab Guidebook
	GPC plus GLC	0.01 ppm	0.05 ppm	IIA	All/fat	Sec. 5.003 FSIS Chemistry Lab Guidebook
	Mills method: Florisil column chromatography	0.01 ppm	0.10 ppm	IIB	All/fat pp	Sec. 5.001 FSIS Chemistry Lab Guidebook
	Extracts from GPC or Mills are confirmed by GC/MS	0.01 ppm	NE	IE (GPC/MS) IF (Mills/MS)	All/fat pp	Sec. 5.004 FSIS Chemistry Lab Guidebook

FSIS RESIDUE ANALYTICAL CAPABILITY

TEST METHOD

Compound	Description	LDL/ MIC	MPL	Level/ Status	Species/ Tissues	Reference
O, O-Diethyl S-[2-(ethyl- thio)ethyl] phosphoro- dithioate	Tissue extracts are quantified by GLC with flame photometric or nitrogen-phosphorous flame ionization detector	NE	NE	IIF	All/liver muscle	Sec. 5.006 FSIS Chemistry Lab Guidebook
Diethylstilbestrol (DES)	Solid phase extraction technique using an internal standard followed by methylisolation for GC/MS quantification and confirmation	0.1 ppb	0.25 ppb	IB	Cattle, sheep liver, muscle	Sec. 5.051 FSIS Chemistry Lab Guidebook
				IE	Cattle/kidney muscle	
Dihydrostreptomycin	Antibiotic screen test (Swab): ability of tissue fluids containing anti-microbial activity to inhibit microbial growth	0.25 ppm	NE	IIIE	All/kidney	J. Food Prot., 1981, 44, 828-831
	Microbiological assay procedure: ability of tissue extracts containing antimicrobial activity to inhibit microbial growth	0.25 ppm	NE	IID	All/kidney liver muscle	Sec. 6.315 FSIS Microbiology Lab Guidebook
3, 5-Dimethyl-4- (methylthio)phenyl methylcarbamate and metabolite	GPC plus HPLC with post- column fluorescence detection Extracts are subjected to reverse phase chromatography, derivatized and confirmed by GC/MS	5 ppb	10 ppb	IIE	All/liver	Copy available upon request
				IE		

Compound	Description	TEST METHOD			Species/ Tissues	Reference
		LDL/ MIC	MPL	Level/ Status		
Dimetridazole and hydroxy metabolite	Extracts are quantified by HPLC/UV	1.0 ppb	NE	IIE	Turkey, swine muscle	Copy available upon request
	Tissue extracts from HPLC are confirmed by GC/NICI/MS	1.0 ppb	NE	IE	Turkey, swine muscle	Copy available upon request
Dioxathion	Tissue extracts are quantified by GLC with flame photometric or nitrogen-phosphorous flame ionization detector	0.10 ppm	NE	IIB	All/liver muscle	Sec. 5.006 FSIS Chemistry Lab Guidebook
Dodecachloro- octahydro-1, 3, 4- metheno-2H- cyclobuta (cd)- pentalene	Micro alumina assay: column chromatography plus GLC	0.04 ppm	NE	IIE	All/fat pp	Sec. 5.002 FSIS Chemistry Lab Guidebook
	GPC plus GLC	0.04 ppm	0.10 ppm	IIA	All/fat	AOAC Book of Methods, 14th Edit., 29.037
	Mills method: Florisil column chromatography plus GLC	0.04 ppm	0.10 ppm	IIB	All/fat pp	Sec. 5.001 FSIS Chemistry Lab Guidebook
Endosulfan I	GPC plus GLC	0.01 ppm	0.10 ppm	IIA-2b	All/fat	Sec. 5.003 FSIS Chemistry Lab Guidebook
	GPC extracts are confirmed by GC/EI/MS	0.05 ppm	NE	IE	Red meat/fat	To be added to Sec. 5.004 FSIS Chemistry Lab Guidebook

FSIS RESIDUE ANALYTICAL CAPABILITY

Compound	Description	TEST METHOD			Species/ Tissues	Reference
		LDL/ MIC	MPL	Level/ Status		
Endosulfan II	GPC plus GLC	0.02 ppm	0.20 ppm	IIA-2b	All/fat	Sec. 5.003 FSIS Chemistry Lab Guidebook
Endrin	Micro alumina assay: column chromatography plus GLC	0.03 ppm	NE	IIE	All/fat pp	Sec. 5.002 FSIS Chemistry Lab Guidebook
	GPC plus GLC	0.03 ppm	0.05 ppm	IIA	All/fat	Sec. 5.003 FSIS Chemistry Lab Guidebook
	Mills method: Florisil column chromatography plus GLC	0.03 ppm	0.10 ppm	IIB	All/fat pp	Sec. 5.001 FSIS Chemistry Lab Guidebook
	Extracts from GPC or Mills are confirmed by GC/MS	0.03 ppm	NE	IE (GPC/MS) IF (Mills/MS)	All/fat pp	Sec. 5.004 FSIS Chemistry Lab Guidebook
Erythromycin	Antibiotic screen test (Swab): ability of tissue fluids containing antimicrobial activity to inhibit microbial growth	25 ppb	NE	IIIE	All/kidney	J. Food Prot., 1981, 44, 828-831
Erythromycin phosphate						
Erythromycin thiocyanate	Microbiological assay procedure: ability of tissue fluids containing antimicrobial activity to inhibit microbial growth	25 ppb	NE	IID	All/kidney liver muscle	Sec. 6.316 FSIS Microbiology Lab Guidebook

FSIS RESIDUE ANALYTICAL CAPABILITY

Compound	Description	TEST METHOD			Species/ Tissues	Reference
		LDL/ MIC	MPL	Level/ Status		
Ethion	Tissue extracts are quantified by GLC with flame photometric or nitrogen-phosphorous flame ionization detector	0.10 ppm	NE	IIB	All/liver muscle	Sec. 5.006 FSIS Chemistry Lab Guidebook
Ethion, oxygen analog of	Tissue extracts are quantified by GLC with flame photometric or nitrogen-phosphorous flame ionization detector	NE	NE	IIE	All/liver muscle	Sec. 5.006 FSIS Chemistry Lab Guidebook
Ethylene dibromide	Residue is co-distilled from aqueous suspension and quantified by GLC	0.5 ppb	1.0 ppb	IIB	All/fat	Sec. 5.005 FSIS Chemistry Lab Guidebook
Fenbendazole	MS by NICI to determine bromine	1 ppb	NE	IE	All/fat	Sec. 5.005 FSIS Chemistry Lab Guidebook
	Extraction with organic solvents followed by HPLC with UV detection; extracts derivatized and confirmed by GC/EI/MS	0.10 ppm	NE	IIE IE	Red meat liver muscle	Copy available upon request
	Tissue extracts are quantified by HPLC	200 ppb	400 ppb	IIB	Cattle, calf liver	NADA 128-620 American Hoechst
	Quantification extract purified by TLC, derivatized and identified by HPLC fluorescence	200 ppb	NE	IIB	Cattle, calf liver	NADA 128-620 American Hoechst

FSIS RESIDUE ANALYTICAL CAPABILITY

Compound	Description	TEST METHOD			Species/ Tissues	Reference
		LDL/ MIC	MPL	Level/ Status		
Fenitrothion	Tissue extracts are quantified by GLC with flame photometric or nitrogen-phosphorous flame ionization detector	0.10 ppm	NE	IIB	All/liver muscle	Sec. 5.006 FSIS Chemistry Lab Guidebook
	Tissue extracts are quantified by GLC with flame photometric or nitrogen-phosphorous flame ionization detector	NE	NE	IIE	All/liver muscle	Sec. 5.006 FSIS Chemistry Lab Guidebook
Flucythrinate	Tissue extracts are quantified by GLC with KCl thermionic detector	0.10 ppm	NE	IIE	All/liver muscle	Sec. 5.016 FSIS Chemistry Lab Guidebook
	Organic solvent extracts are quantified as the sum of both isomers by GC/EC	1 ppm	NE	IIE	Red meat/fat	Copy available upon request
Gasoline	Fat from product is heated in a sealed vial and gasoline components are identified by pattern recognition using GC/flame ionization detection	0.1 ppm	NE	IE	All/muscle	Sec. 5.027 FSIS Chemistry Lab Guidebook
	Tissue extracts are screened by E-Z Screen	50 ppb	NE	IIIE	All/muscle liver kidney	Environmental Diagnostics
Gentamicin sulfate	Microbiological assay procedure: ability of tissue extracts containing antimicrobial activity to inhibit microbial growth	NE	NE	IIB	Swine/kidney	NADA 103-037& 91-191 Schering

Compound	Description	TEST METHOD			Species/ Tissues	Reference
		LDL/ MIC	MPL	Level/ Status		
Gentamicin sulfate, continued	Extraction followed by detection by HPLC by fluorescence detector	0.2 ppm	0.4 ppm	IB	Swine/kidney	Sec. 5.043 FSIS Chemistry Lab Guidebook
Gentian violet	Method attributes are being determined					
Halofuginone	Tissue extracts are quantified by HPLC/UV	0.05 ppm	0.05 ppm	IIB	Chicken/liver muscle	Sec. 5.041 FSIS Chemistry Lab Guidebook
	Tissue extracts are confirmed by GC/MS/MS	0.05 ppm	NE	IB	Chicken/liver muscle	NADA 130-951 American Hoechst
HCB	Micro alumina assay: column chromatography plus GLC	0.01 ppm	NE	IIE	All/fat pp	Sec. 5.002 FSIS Chemistry Lab Guidebook
	GPC plus GLC	0.01 ppm	0.05 ppm	IIA	All/fat	Sec. 5.003 FSIS Chemistry Lab Guidebook
	Mills method: Florisil column chromatography plus GLC	0.01 ppm	0.10 ppm	IIB	All/fat pp	Sec. 5.001 FSIS Chemistry Lab Guidebook
	Extracts from GPC or Mills are confirmed by GC/MS	0.01 ppm	NE	IE (GPC/MS) IF (Mills/MS)	All/fat pp	Sec. 5.004 FSIS Chemistry Lab Guidebook

FSIS RESIDUE ANALYTICAL CAPABILITY

Compound	Description	TEST METHOD				Species/ Tissues	Reference
		LDL/ MIC	MPL	Level/ Status			
Heptachlor and heptachlor epoxide	Micro alumina assay: column chromatography plus GLC	0.01 ppm	NE	IIE	All/fat pp	Sec. 5.002 FSIS Chemistry Lab Guidebook	
	GPC plus GLC	0.01 ppm	0.05 ppm	IIA	All/fat	Sec. 5.003 FSIS Chemistry Lab Guidebook	
	Mills method: Florisil column chromatography plus GLC	0.01 ppm	0.10 ppm	IIB	All/fat pp	Sec. 5.001 FSIS Chemistry Lab Guidebook	
Hetacillin, Potassium	Extracts from GPC or Mills are confirmed by GC/MS	0.01 ppm	NE	IE (GPC/MS) IF (Mills/MS)	All/fat pp	Sec. 5.004 FSIS Chemistry Lab Guidebook	
	Antibiotic screen test (Swab): ability of tissue fluids containing anti- microbial activity to inhibit microbial growth	NE	NE	IIIE	All/kidney	J. Food Prot., 1981, 44, 828-831	
	5-Hydroxy- thiabendazole	Extraction with organic solvents followed by HPLC with UV detection; extracts confirmed by derivatized GC/EI/MS	0.05 ppm	NE	IIE IE	Red meat liver muscle	Copy available upon request
Hygromycin B	Antibiotic screen test (Swab): ability of tissue fluids containing anti- microbial activity to inhibit microbial growth	5.00 ppm	NE	IIIE	All/kidney	J. Food Prot., 1981, 44, 828-831	

FSIS RESIDUE ANALYTICAL CAPABILITY

Compound	Description	TEST METHOD			Species/ Tissues	Reference
		LDL/ MIC	MPL	Level/ Status		
Iprnidazole and hydroxy metabolite	Tissue extracts are quantified by HPLC/UV	1.0 ppb	NE	IIE	Turkey, swine muscle	Copy available upon request
	Tissue extracts from HPLC are confirmed by GC/NIC/MS	1.0 ppb	NE	IE	Turkey, swine muscle	Sec. 5.013 FSIS Chemistry Lab Guidebook
	Dry ashed tissue is dissolved and quantified by AAS	0.50 ppm	NE	IB	All/kidney liver muscle	Sec. 5.010 FSIS Chemistry Lab Guidebook
Iron	Dry ashed tissue is dissolved and quantified by inductively coupled plasma (ICP)	NE	16.0 ppb	IE	All/kidney liver muscle	Copy available upon request
	Dry ashed tissue is dissolved and reacted to produce a red complex, which is quantified by colorimetry	NE	NE	IIE	All/all	Sec. 6.009 FSIS Chemistry Lab Guidebook
Ivermectin	Wet ashed tissue is quantified by AAS	NE	NE	IIIE	All/kidney liver muscle	Sec. 6.008 FSIS Chemistry Lab Guidebook
	Tissue extracts are quantified by HPLC fluorescence	2 ppb	5 ppb	IIB	Red meat liver muscle	Sec. 5.035 FSIS Chemistry Lab Guidebook
	Derivatization to form 3 components with detection by HPLC fluorescence	2 ppb	NE	IB	Red meat liver muscle	Sec. 5.035 FSIS Chemistry Lab Guidebook

FSIS RESIDUE ANALYTICAL CAPABILITY

Compound	Description	TEST METHOD			Species/ Tissues	Reference
		LDL/ MIC	MPL	Level/ Status		
Lasalocid	Tissue extracts are quantified by HPLC fluorescence detector	0.025 ppm	0.35 ppm	IIB	Cattle/liver	Sec. 5.029 FSIS Chemistry Lab Guidebook
		0.025 ppm	NE	IIE	Poultry/fat skin	
	Tissue extraction followed by bioautography	0.005 ppm	0.01 ppm	IIB	Poultry/fat skin	NADA 96-298V Hoffman-LaRoche
		0.2 ppm	NE	IB	Cattle/liver	
Lead	GC pyrolysis of the HPLC extract with MS identification of the fragments	0.2 ppm	NE	IE	Poultry/fat, skin	NADA 96-298V Hoffman-LaRoche
		0.03 ppm	0.05 ppm	IB	All/kidney liver muscle	
	Dry ashed tissue is dissolved and quantified by AAS	NE	1.67 ppb	IE	All/kidney liver muscle	Sec. 5.010 FSIS Chemistry Lab Guidebook
		NE	1.0 ppb	IE	Poultry kidney liver	
Levamisole	Tissue extracts are quantified by GLC flame photometric detection	0.05 ppm	NE	IIE	Red meat liver muscle	Sec. 5.033 FSIS Chemistry Lab Guidebook
		0.05 ppm	NE	1 ¹ E	Red meat liver muscle	
	Tissue extracts are subjected to GC/MS	0.05 ppm	NE			Copy available upon request

1 Applies only when used in combination with FSIS Chemistry Lab Guidebook Section 5.033 method.

Compound	Description	TEST METHOD			Species/ Tissues	Reference
		LDL/ MIC	MPL	Level/ Status		
Lincomycin hydrochloride	Microbiological assay procedure: ability of tissue extracts containing antimicrobial activity to inhibit microbial growth	0.10 ppm	0.10 ppm	IIC	Poultry, swine/all	NADA 97-505 Upjohn
Lindane	Micro alumina assay: column chromatography plus GLC	0.01 ppm	NE	IIE	All/fat pp	Sec. 5.002 FSIS Chemistry Lab Guidebook
	GPC plus GLC	0.01 ppm	0.05 ppm	IIA	All/fat	Sec. 5.003 FSIS Chemistry Lab Guidebook
	Mills method: Florisil column chromatography plus GLC	0.01 ppm	0.10 ppm	IIB	All/fat pp	Sec. 5.001 FSIS Chemistry Lab Guidebook
	Extracts from GPC or Mills are confirmed by GC/MS	0.01 ppm	NE	IE (GPC/MS) IF (Mills/MS)	All/fat pp	Sec. 5.004 FSIS Chemistry Lab Guidebook
Linuron	GPC plus GLC	0.25 ppm	0.50 ppm	IIA-2b	All/fat	Sec. 5.003 FSIS Chemistry Lab Guidebook
	Extracts are confirmed by GC/EI/MS	0.05 ppm	NE	IE	Red meat fat	To be added to Sec. 5.004 FSIS Chemistry Lab Guidebook

FSIS RESIDUE ANALYTICAL CAPABILITY

Compound	Description	TEST METHOD			Species/ Tissues	Reference
		LDL/ MIC	MPL	Level/ Status		
Lysergic acid diethylamide	Tissue extracts are spotted for TLC and detected with specific chromagenic reagent	NE	NE	I ¹ E	All/kidney liver muscle pp	Sec. 5.028 FSIS Chemistry Lab Guidebook
Malathion	Tissue extracts are quantified by GLC with flame photometric or nitrogen-phosphorous flame ionization detector	0.10 ppm	NE	IIB	All/liver muscle	Sec. 5.006 FSIS Chemistry Lab Guidebook
Manganese	Dry ashed tissue is dissolved and quantified by AAS	0.05 ppm	NE	IE	All/kidney liver muscle	Sec. 5.010 FSIS Chemistry Lab Guidebook
Mebendazole	Dry ashed tissue is dissolved and quantified by inductively coupled plasma (ICP)	NE	0.67 ppb	IE	All/kidney liver muscle	Copy available upon request
Mebendazole	Extraction with organic solvents followed by HPLC with UV detection; extracts are confirmed by GC/EI/MS	0.05 ppm	NE	IIE	Red meat liver muscle IE	Copy available upon request
Melengestrol acetate (MGA)	Tissue extract is column chromatographed on Florisil and quantified by GLC	5.0 ppb	10.0 ppb	IIB&C	Cattle/muscle kidney liver fat	Sec. 5.040 FSIS Chemistry Lab Guidebook
	Extracts are derivatized with HFB and confirmed by GC/EI/MS	5.0 ppb	10.0 ppb	IE	Cattle/fat	Copy available upon request

1 Applies only to compound identification.

Compound	Description	TEST METHOD			Species/ Tissues	Reference
		LDL/ MIC	MPL	Level/ Status		
Mercury	Tissue is digested in acid. Mercury is reduced to its vapor and quantified by flameless AAS	0.01 ppm	0.02 ppm	IB	All/kidney liver muscle	Sec. 5.007 FSIS Chemistry Lab Guidebook
Methanearsonic acid	Dry ashed tissue is dissolved and reacted to produce arsine gas, which is quantified by AAS		0.05	NE	IE liver muscle	All/kidneySec. 5.009 FSIS Chemistry Lab Guidebook
	Dry ashed tissue is dissolved and reacted to produce arsine gas, which reacts to form blue complex for colorimetric quantification		0.05 ppm	0.20	IIA liver muscle	All/kidneyAOAC Book of Methods, 14th Edit., 25.050
Methomyl	GPC plus HPLC with post-column fluorescence detection	5 ppb	10 ppb	IIE	All/liver	Copy available upon request
	Extracts are subjected to reverse phase chromatography, derivatized and confirmed by GC/MS				IE	
Methoxychlor	Micro alumina assay: column chromatography plus GLC	0.15 ppm	NE	IIE	All/fat pp	Sec. 5.002 FSIS Chemistry Lab Guidebook
	GPC plus GLC	0.15 ppm	0.50 ppm	IIA	All/fat	Sec. 5.003 FSIS Chemistry Lab Guidebook
	Mills method: Florisil column chromatography plus GLC	0.15 ppm	0.50 ppm	IIB	All/fat pp	Sec. 5.001 FSIS Chemistry Lab Guidebook

FSIS RESIDUE ANALYTICAL CAPABILITY

Compound	Description	TEST METHOD			Species/ Tissues	Reference
		LDL/ MIC	MPL	Level/ Status		
Methoxychlor, continued	Extracts from GPC or Mills are confirmed by GC/MS	0.15 ppm	NE	IE	All/fat pp	Sec. 5.004 FSIS Chemistry Lab Guidebook
				(GPC/MS) IF (Mills/MS)		
Methyl parathion	Tissue extracts are quantified by 0.10 GLC with flame photometric or ppm nitrogen-phosphorous flame ionization detector		NE	IIB	All/liver muscle	Sec. 5.006 FSIS Chemistry Lab Guidebook
Monensin	Tissue extract is partitioned by TLC and semi-quantified by inhibition of microorganism growth	0.05 ppm	0.10 ppm	IIB	Cattle, poultry liver fat	NADA 38-878V Eli Lilly
Morantel tartrate	Tissue extract is hydro- lyzed and a derivative is quantified by GLC	0.25 ppm	0.50 ppm	IIB	Cattle/liver	Sec. 5.046 FSIS Chemistry Lab Guidebook
				IIE	Cattle/muscle	
Narasin	Identification of a structurally significant hydrolyzed fragment by GC/MS	0.25 ppm	NE	IB	Cattle/liver muscle	NADA 92-444 NADA 93-903 Pfizer
Neomycin sulfate	Tissue extracts are spotted on TLC and quantified with a bio- autographic overlay	5 ppb	NE	IIB	Cattle, poultry liver kidney fat	Sec. 5.042 FSIS Chemistry
					Lab Guidebook	
Neomycin sulfate	Tissue is deproteinized, acidified, and extracted; quantified by HPLC/UV	1.5 ppm	NE	IIB	All/kidney	FDA Center for Veterinary Medicine- sponsored validation;. copy available upon request

TEST METHOD

Compound	Description	LDL/ MIC	MPL	Level/ Status	Species/ Tissues	Reference
Neomycin sulfate, continued	Antibiotic screen test (Swab): ability of tissue fluids containing anti-microbial activity to inhibit microbial growth	0.25 ppm	NE	IIIE	All/kidney	J. Food Prot., 1981, 44, 828-831
	Tissue extracts are screened by E-Z Screen	50 ppb	NE	IIIE	All/muscle liver kidney	Environmental Diagnostics
	Microbiological assay pro- cedure: ability of tissue extracts containing antimicrobial activity to inhibit microbial growth	0.25 ppm	NE	IID	All/kidney liver muscle	Sec. 6.317 FSIS Microbiology Lab Guidebook
Nequinatone	Zymark Pyrotechnology System: Tissue extracts are screened by HPLC/UV	NE	NE	IIIE	Cattle/liver muscle	Copy available upon request
Nicarbazin	Tissues are extracted with ethyl acetate; the dinitrocarbanilide moiety is quantified by HPLC with a UV detector Extracts verified by photodiode array detection	0.1 ppm	2.0 ppm	IIB	Chicken all tissues	NADA AM AA- CARIO-AB755 Eli Lilly
Nickel				IE		Information available upon request
	Dry ashed tissue is dissolved and quantified by AAS	0.20 ppm	NE	IB	All/kidney liver muscle	Sec. 5.010 FSIS Chemistry Lab Guidebook
	Dry ashed tissue is dissolved and quantified by inductively coupled plasma (ICP)	NE	0.34 ppb	IE	All/kidney liver muscle	Copy available upon request

FSIS RESIDUE ANALYTICAL CAPABILITY

Compound	Description	TEST METHOD			Species/ Tissues	Reference
		LDL/ MIC	MPL	Level/ Status		
Nonachlor	Micro alumina assay: column chromatography plus GLC	0.05 ppm	NE	IIE	All/fat pp	Sec. 5.002 FSIS Chemistry Lab Guidebook
	GPC plus GLC	0.03 ppm	0.15 ppm	IIA	All/fat	Sec. 5.003 FSIS Chemistry Lab Guidebook
	Mills method: Florisil column chromatography plus GLC	0.05 ppm	0.15 ppm	IIB	All/fat pp	Sec. 5.001 FSIS Chemistry Lab Guidebook
	Extracts from GPC or Mills are confirmed by GC/MS	0.05 ppm	NE	IE	All/fat pp	Sec. 5.004 FSIS Chemistry Lab Guidebook
Novobiocin	Microbiological assay procedure: ability of tissue extracts containing antimicrobial activity to inhibit microbial growth	0.125 ppm	NE	IID	All/kidney liver muscle	Kramer, et al. FDA 1974
	Zymark Pytechnlogy System: organic solvent extraction followed by HPLC/UV detection	0.50 ppm	NE	IIE	All/kidney liver muscle	Copy available upon request
	Manual system organic solvent extraction followed by HPLC/UV detection	0.50 ppm	NE	IIE	All/kidney liver muscle	Copy available upon request
Oleandomycin	Antibiotic screen test (Swab): ability of tissue fluids containing antimicrobial activity to inhibit microbial growth	0.25 ppm	NE	IIIE	All/kidney	J. Food Prot., 1981, 44, 828-831

Compound	Description	TEST METHOD			Species/ Tissues	Reference
		LDL/ MIC	MPL	Level/ Status		
Oxfendazole	Extraction with organic solvents followed by HPLC with UV detection; extracts are derivatized and confirmed by GC/EI/MS	0.05 ppm	NE	IIE	Red meat, pp liver muscle IE	Copy available upon request
Oxytetracycline hydrochloride	Antibiotic screen test (Swab): ability of tissue fluids containing antimicrobial activity to inhibit microbial growth	0.08 ppm	NE	IIIE	All/kidney	J. Food Prot., 1981, 44, 828-831
	Microbiological assay procedure: ability of tissue extracts containing antimicrobial activity to inhibit microbial growth	0.08 ppm	0.08 ppm	IID	All/kidney liver muscle	Sec. 6.312 FSIS Microbiology Lab Guidebook
	Tissue extraction of parent drug is converted to anhydro derivative for identification by TLC	0.1 ppm	NE	IIE	All/kidney liver muscle	Copy available upon request
Parathion	Tissue extracts are quantified by GLC with flame photometric or nitrogen-phosphorous flame ionization detector	NE	NE	IIB	All/liver muscle	Sec. 5.006 FSIS Chemistry Lab Guidebook
PBB's	Micro alumina assay: column chromatography plus GLC detection by electron capture. UV degradation of PBB's is used as confirmation	0.05 ppm	NE	IIE	All/fat	Ralston-Purina Method MP-PBB.36 9/12/79

FSIS RESIDUE ANALYTICAL CAPABILITY

Compound	Description	TEST METHOD			Species/ Tissues	Reference
		LDL/ MIC	MPL	Level/ Status		
PCB's (reported as Aroclor 1242, 1248, 1254, 1260, etc.)	Micro alumina assay: column chromatography plus GLC	0.30 ppm	NE	IIE	All/fat pp	Sec. 5.002 FSIS Chemistry Lab Guidebook
	GPC plus GLC	0.30 ppm	0.50 ppm	IIA-2b	All/fat	Sec. 5.003 FSIS Chemistry Lab Guidebook
Penicillin, procaine and procaine G	Antibiotic screen test (Swab): ability of tissue fluids containing anti- microbial activity to inhibit microbial growth	12.5 ppb	NE	IIIE	All/kidney	J. Food Prot., 1981, 44, 828-831
Penicillin G (benzathine, free acid, sodium salt, and procaine salts)	Microbiological assay procedure: ability of tissue extracts containing antimicrobial activity to inhibit microbial growth	12.5 ppb	NE	IID	All/kidney liver muscle	Sec. 6.311 FSIS Microbiology Lab Guidebook
Pentachloroarsole	GPC plus GC	NE	NE	IIA-2b	Poultry/fat	Sec. 5.003 FSIS Chemistry Lab Guidebook
	Extracts confirmed by GC/EI/MS	NE	NE	IIE	Poultry/fat	Information available upon request
Pentachlorophenol	Tissue digestate is extracted with cyclo- hexane and quantified by GLC	0.03 ppm	0.05 ppm	IIB	All/liver muscle	Sec. 5.024 FSIS Chemistry Lab Guidebook

Compound	Description	TEST METHOD			Species/ Tissues	Reference
		LDL/ MIC	MPL	Level/ Status		
Pentachlorophenol, continued	Tissue extracts for GLC are confirmed by GC/MS	0.03 ppm	NE	IE	All/liver muscle	Sec. 5.025 FSIS Chemistry Lab Guidebook
	GPC plus GC	NE	NE	IIA-2b	Poultry/fat	Sec. 5.003 FSIS Chemistry Lab Guidebook
	Extracts confirmed by GC/EI/MS	NE	NE	IIE	Poultry/fat	Information available upon request
Permethrin (cis & trans)	Solvent extraction followed by a competitive ELISA determination	1.0 ppm	NE	IIIE	All/fat	Copy available upon request
	Organic solvent extracts are quantified as the sum of both isomers; extracts are confirmed by GC/EI/MS	1.0 ppm	NE	IIE IE	All/fat	Copy available upon request
	Tissue extracts are spotted for TLC with specific chromogenic reagent	NE	NE	IIIE	All/liver muscle	Sec. 5.028 FSIS Chemistry Lab Guidebook
Phosalone	GPC plus GLC	0.01 ppm	0.05 ppm	IIA-2b	All/fat	Sec. 5.003 FSIS Chemistry Lab Guidebook
	GPC extracts are confirmed by GC/EI/MS	0.02 ppm	NE	IE	Red meat fat	To be added to Sec. 5.004 FSIS Chemistry Lab Guidebook

FSIS RESIDUE ANALYTICAL CAPABILITY

Compound	Description	TEST METHOD			Species/ Tissues	Reference
		LDL/ MIC	MPL	Level/ Status		
Propazine	Fat extracted using C18 columns and quantified by capillary GC with nitrogen-phosphorous detector	5 ppb	5	NE	IIE	All/fatCopy available upon request
Pyrantel tartrate	Extracts confirmed by GC/MS	5 ppb	NE	IE	All/fat	Sec. 5.032 FSIS Chemistry Lab Guidebook
	Tissue extract is hydrolyzed and a derivative is quantified by GLC	0.25 ppm	0.50 ppm	IIB	Swine/liver muscle	Sec. 5.046 FSIS Chemistry Lab Guidebook
	Identification of a structurally significant hydrolyzed fragment by GC/MS	0.25 ppm	NE	IE	Swine/liver muscle	JAOAC, 65, 3 640-646(1982)
Ronnell	Tissue extracts are quantified by GLC with flame photometric or nitrogen-phosphorous flame ionization detector	NE	NE	IIB	All/liver muscle	Sec. 5.006 FSIS Chemistry Lab Guidebook
	GPC plus GLC	0.02 ppm	0.05 ppm	IIA-2b	All/fat	Sec. 5.003 FSIS Chemistry Lab Guidebook
	Extracts are confirmed by GC/EI/MS	0.01 ppm (poultry) 0.10 ppm (red meat)	NE	IE	Poultry, red meat fat	To be added to Sec. 5.004 FSIS Chemistry Lab Guidebook

Compound	Description	TEST METHOD			Species/ Tissues	Reference
		LDL/ MIC	MPL	Level/ Status		
Roxarsone	Dry ashed tissue is dissolved and reacted to produce arsine gas, which is quantified by AAS	0.05 ppm	NE	IE	All/kidney liver muscle	Sec. 5.009 FSIS Chemistry Lab Guidebook
	Dry ashed tissue is dissolved and reacted to produce arsine gas, which reacts to form blue complex for colorimetric quantification	0.05 ppm	0.20 ppm	IIA	All/kidney liver muscle	AOAC Book of Methods, 14th Edit., 25.050
Selenium	Tissue is digested in acid and quantified by graphite furnace AAS	0.02 ppm	NE	IE	All/kidney liver muscle	Copy available upon request
Simazine	Fat extracted using C18 columns and quantified by capillary GC with nitrogen-phosphorous detector		5	NE	IIE	All/fatCopy available upon request
	Extracts confirmed by GC/MS	5 ppb	NE	IE	All/fat	Sec. 5.032 FSIS Chemistry Lab Guidebook
Spectinomycin hydrochloride	Microbiological assay: tissue extracts are quantified using a turbidimetric assay	2.8 ppm	NE	IIIE	All/kidney liver muscle	NADA 47-244 Upjohn
Streptomycin	Antibiotic screen test (Swab): ability of tissue fluids containing antimicrobial activity to inhibit microbial growth	0.25 ppm	NE	IIIE	All/kidney	J. Food Prot., 1981, 44, 828-831

FSIS RESIDUE ANALYTICAL CAPABILITY

Compound	Description	TEST METHOD			Species/ Tissues	Reference
		LDL/ MIC	MPL	Level/ Status		
Streptomycin, continued	Microbiological assay procedure: ability of tissue extracts containing antimicrobial activity to inhibit microbial growth	0.25 ppm	NE	IID	All/kidney liver muscle	Sec. 6.315 FSIS Microbiology Lab Guidebook
Styrene	Tissues are subjected to GC/MS head space analysis	1 ppb	NE	I ¹ F	All/kidney liver muscle fat pp	Sec. 5.026 FSIS Chemistry Lab Guidebook
Sulfabromomethazine	TLC fluorescence: tissue extracts are partitioned by TLC and quantified by densitometry	0.02 ppm	0.05 ppm	IIA-2b	Red meat liver muscle	Sec. 5.018 FSIS Chemistry Lab Guidebook
Sulfachlorpyridazine	TLC fluorescence: tissue extracts are partitioned by TLC and quantified by densitometry	0.02 ppm	0.05 ppm	IIA-2b	Red meat liver muscle	Sec. 5.018 FSIS Chemistry Lab Guidebook
Sulfadiazine	TLC fluorescence: tissue extracts are partitioned by TLC and quantified by densitometry	0.02 ppm	NE	IIA-2b	Red meat liver muscle	Sec. 5.018 FSIS Chemistry Lab Guidebook
	Extraction followed by GC/CI and EI/MS	0.05 ppm	NE	IB-2	Red meat liver muscle	Sec. 5.019 FSIS Chemistry Lab Guidebook
Sulfadimethoxine	TLC fluorescence: tissue extracts are partitioned by TLC and quantified by densitometry	0.02 ppm	0.05 ppm	IIA	All/liver muscle	Sec. 5.018 FSIS Chemistry Lab Guidebook

1 Method is semi-quantitative.

Compound	Description	TEST METHOD				Species/ Tissues	Reference
		LDL/ MIC	MPL	Level/ Status			
Sulfadimethoxine, continued	Extraction followed by GC/EI/MS	0.05	NE ppm	IB	All/liver muscle	Sec. 5.019 FSIS Chemistry Lab Guidebook	
	Tissue extracts are screened by E-Z Screen	50 ppb	NE	IIIE	All/liver	Environmetal Diagnostics	
Sulfadoxine	TLC fluorescence: tissue extracts are partitioned by TLC and quantified by densitometry	0.05 ppm	NE	IIA-2b	Red meat liver muscle	Sec. 5.018 FSIS Chemistry Lab Guidebook	
	Tissue extracts are confirmed by GC/EI/MS	NE	NE	IB-2	Red meat liver muscle	Extracts from Sec. 5.018 FSIS Chemistry Lab Guidebook confirmed by GC/EI/MS	
Sulfaethoxypyridazine	TLC fluorescence: tissue extracts are partitioned by TLC and quantified by densitometry	0.02 ppm	0.05 ppm	IIA-2b	Red meat liver muscle	Sec. 5.018 FSIS Chemistry Lab Guidebook	
	TLC fluorescence: tissue extracts are partitioned by TLC and quantified by densitometry	0.02 ppm	0.05 ppm	IIA	All/liver muscle	Sec. 5.018 FSIS Chemistry Lab Guidebook	
Sulfamethazine	Tissue extracts are confirmed by GC/EI/MS	0.05 ppm	NE	IB IE	Red meat/feed concentrate pp All/liver muscle All/pp	Sec. 5.019 FSIS Chemistry Lab Guidebook	
	Tissue extracts are detected by TLC fluorescence (SOS-urine)	NE	NE	IIIG	Swine/urine	Copy available upon request	

FSIS RESIDUE ANALYTICAL CAPABILITY

Compound	Description	TEST METHOD			Species/ Tissues	Reference
		LDL/ MIC	MPL	Level/ Status		
Sulfamethazine, continued	Tissue extracts are screened by E-Z Screen	50 ppb	NE	IIIE	All/liver	Environmental Diagnostics
Sulfamethoxy- pyridazine	TLC fluorescence: tissue extracts are partitioned by TLC and quantified by densitometry	0.02 ppm	0.05 ppm	IIA-2b	Red meat liver muscle	Sec. 5.018 FSIS Chemistry Lab Guidebook
Sulfaphenazole	TLC fluorescence: tissue extracts are partitioned by TLC and quantified by densitometry	0.05 ppm	NE	IIA-2b	Red meat liver muscle	Sec. 5.018 FSIS Chemistry Lab Guidebook
Sulfapyridine	Tissue extracts are confirmed by GC/EI/MS	NE	NE	IB-2	Red meat liver muscle	Extracts from Sec. 5.018 FSIS Chemistry Lab Guidebook confirmed by GC/EI/MS
Sulfapyridine	TLC fluorescence: tissue extracts are partitioned by TLC and quantified by densitometry	0.02 ppm	0.05 ppm	IIA-2b	All/liver muscle	Sec. 5.018 FSIS Chemistry Lab Guidebook
Sulfaquinolone	Tissue extracts are confirmed by GC/EI/MS	0.05	NE	IB-1&2	All/liver muscle pp	TLC extracts from Sec. 5.018
Sulfaquinolone	TLC fluorescence: tissue extracts are partitioned by TLC and quantified by densitometry	12.5 ppb	25 ppb	IIA ¹	Poultry/liver muscle	Sec. 5.018 FSIS Chemistry Lab Guidebook

¹ Method modified and reevaluated at 25 ppb.

Compound	Description	TEST METHOD			Species/ Tissues	Reference
		LDL/ MIC	MPL	Level/ Status		
Sulfaquinoxaline, continued	Tissue extracts are confirmed by GC/EI/MS	25 ppb	NE	IB ¹	Poultry/liver muscle	Sec. 5.019 FSIS Chemistry Lab Guidebook
	TLC fluorescence: tissue extracts are partitioned by TLC and quantified by densitometry	0.02 ppm	0.05 ppm	IIA-1	Red meat liver muscle	Sec. 5.018 FSIS Chemistry Lab Guidebook
Sulfathiazole	Tissue extracts are confirmed by GC/EI/MS	0.05 ppm	NE	IB	Red meat liver muscle pp	Sec. 5.019 FSIS Chemistry Lab Guidebook
	TLC fluorescence: tissue extracts are partitioned by TLC and quantified by densitometry	0.05 ppm	NE	IIA-2b	Red meat liver muscle	Sec. 5.018 FSIS Chemistry Lab Guidebook
Sulfatroxazole	Tissue extracts are confirmed by GC/EI/MS	NE	NE	IB-2	Red meat liver muscle	Extracts from Sec. 5.018 FSIS Chemistry Lab Guidebook confirmed by GC/EI/MS
	TLC fluorescence: tissue extracts are partitioned by TLC and quantified by densitometry	0.05 ppm	NE	IIA-2b	Red meat liver muscle	Sec. 5.018 FSIS Chemistry Lab Guidebook
Sulfisoxazole	Tissue extracts are confirmed by GC/EI/MS	NE	NE	IB-2	Red meat liver muscle	Extracts from Sec. 5.018 FSIS Chemistry Lab Guidebook confirmed by GC/EI/MS
	TLC fluorescence: tissue extracts are partitioned by TLC and quantified by densitometry	0.05 ppm	NE	IIA-2b	Red meat liver muscle	Sec. 5.018 FSIS Chemistry Lab Guidebook
Sulfisoxazole	Tissue extracts are confirmed by GC/EI/MS	NE	NE	IB-2	Red meat liver muscle	Extracts from Sec. 5.018 FSIS Chemistry Lab Guidebook confirmed by GC/EI/MS
	TLC fluorescence: tissue extracts are partitioned by TLC and quantified by densitometry	0.05 ppm	NE	IIA-2b	Red meat liver muscle	Sec. 5.018 FSIS Chemistry Lab Guidebook

1 Restudied in one laboratory at 25 ppb.

FSIS RESIDUE ANALYTICAL CAPABILITY

Compound	Description	TEST METHOD			Species/ Tissues	Reference
		LDL/ MIC	MPL	Level/ Status		
TDE (metabolite of DDT reported as DDT)	Micro alumina assay: column chromatography plus GLC	0.04 ppm	NE	IIE	All/fat pp	Sec. 5.002 FSIS Chemistry Lab Guidebook
	GPC plus GLC	0.03 ppm	0.15 ppm	IIA	All/fat	Sec. 5.003 FSIS Chemistry Lab Guidebook
	Mills method: Florisil column chromatography plus GLC	0.04 ppm	0.15 ppm	IIB	All/fat pp	Sec. 5.001 FSIS Chemistry Lab Guidebook
	Extracts from GPC or Mills are confirmed by GC/MS	0.02 ppm	NE	IE (GPC/MS) IF (Mills/MS)	All/fat pp	Sec. 5.004 FSIS Chemistry Lab Guidebook
Terbutylazine	Fat extracted using C18 columns and quantified by capillary GC with nitrogen-phosphorous detector		5	NE	IIE	All/fat Copy available upon request
Terpene polychlorinateds	Extracts confirmed by GC/MS	5 ppb	NE	IE	All/fat	Sec. 5.032 FSIS Chemistry Lab Guidebook
	Micro alumina assay: column chromatography plus GLC	0.50 ppm	NE	IIE	All/fat	Sec. 5.002 FSIS Chemistry Lab Guidebook
	Mills method: Florisil column chromatography plus GLC	0.50 ppm	NE	IIE	All/fat	Sec. 5.001 FSIS Chemistry Lab Guidebook

Compound	Description	LDL/ MIC	TEST METHOD		Species/ Tissues	Reference
			MPL	Level/ Status		
Tetracycline hydrochloride	Antibiotic screen test (Swab): ability of tissue chloride fluids containing anti-microbial activity to inhibit microbial growth	0.08 ppm	NE	IIIE	All/kidney	J. Food Prot., 1981, 44, 828-831
	Microbiological assay pro- cedure: ability of tissue extracts containing antimicrobial activity to inhibit microbial growth	0.08 ppm	NE	IID	All/kidney liver muscle	Sec. 6.312 FSIS Microbiology Lab Guidebook
Thiabendazole	Tissue extraction of parent drug is converted to anhydro derivative for identification by TLC	0.1 ppm	NE	IIE	All/kidney liver muscle	Copy available upon request
	pH extraction with organic solvents followed by HPLC with UV detection; extracts derivatized and confirmed by GC/EI/MS	0.05 ppm	NE	IIE IE	Red meat, pp liver muscle	Copy available upon request
	Organic solvent extraction followed by GC of the 8-hydroxymutinin metabolite	0.2 ppm	0.4 ppm	IIB	Swine/liver	INAD 1776 Diamond- Shamrock Corp.
Tiamulin	Extracts confirmed by GC/MS	NE	0.4 ppm	IB	Swine/liver	INAD 1776 Diamond- Shamrock Corp.
	Tissue is dry ashed and dissolved and quantified by AAS (used to screen for organotin compounds)	0.02 ppm	NE	IE	All/kidney liver muscle	Sec. 5.009 FSIS Chemistry Lab Guidebook

Compound	Description	TEST METHOD			Species/ Tissues	Reference
		LDL/ MIC	MPL	Level/ Status		
Toxaphene	Micro alumina assay: column chromatography plus GLC	0.50 ppm	NE	IIE	All/fat pp	Sec. 5.002 FSIS Chemistry Lab Guidebook
	GPC plus GLC	0.50 ppm	NE	IIE	All/fat	Sec. 5.003 FSIS Chemistry Lab Guidebook
	Mills method: Florisil column chromatography plus GLC	0.50 ppm	1.00 ppm	IIB	All/fat pp	Sec. 5.001 FSIS Chemistry Lab Guidebook
Trichlorfon	Tissue extracts are quantified by GLC with flame photometric or nitrogen-phosphorous flame ionization detector	NE	NE	IIE	All/liver muscle	Sec. 5.006 FSIS Chemistry Lab Guidebook
Tylosin	Antibiotic screen test (Swab): ability of tissue fluids containing anti- microbial activity to inhibit microbial growth	0.20 ppm	NE	IIIE	All/kidney	J. Food Prot., 1981, 44, 828-831
	Tissue extracts are screened by E-Z screen	50 ppb	NE	IIIE	All/muscle liver kidney	Environmental Diagnostics
	Liquid-liquid extraction followed by HPLC-UV detection	0.1 ppm	NE	IIE	Cattle/muscle	Copy available upon request

Compound	Description	TEST METHOD			Species/ Tissues	Reference
		LDL/ MIC	MPL	Level/ Status		
Virginiamycin	Microbiological assay procedure: ability of tissue extracts containing antimicrobial activity to inhibit microbial growth	0.64 ppm	NE	IIE	Swine kidney liver muscle	NADA 91-467 & 91-513 Smith Kline & French
		0.1 ppm	NE	IIE	All/kidney liver muscle	Copy available upon request
		1.0 ppb	NE	IIIE	Cattle/liver muscle	Sec. 5.049 FSIS Chemistry Lab Guidebook
Zeranol and metabolite taleranol	Solid phase extraction using an internal standard followed by polymethylsililation for GC/MS quantification and confirmation	1.0 ppb (zeranol)	NE	IE	Cattle, sheep liver, muscle	Sec. 5.051 FSIS Chemistry Lab Guidebook
		4.0 ppb (taleranol)				
Zinc	Dry ashed tissue is dissolved and quantified by AAS	NE	NE	IB	All/kidney liver muscle	Sec. 5.010 FSIS Chemistry Lab Guidebook
		NE	16.0 ppb	IE	All/kidney liver muscle	Copy available upon request

Section 4

NATIONAL RESIDUE PROGRAM--
COMPOUNDS INCLUDED

Compounds/Years	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Aflatoxin ¹		X	X		X					
Albendazole					X	X		X	X	X
Aldicarb								X	X	X
Aldrin	X	X	X	X	X	X	X	X	X	X
Amoxicillin trihydrate	X	X	X	X	X	X	X	X	X	
Ampicillin	X	X	X	X	X	X	X	X	X	
Ampicillin trihydrate	X	X	X	X	X	X	X	X	X	
Apramycin				X	X	X				
Arsanilate sodium	X	X	X	X	X	X	X	X	X	X
Arsanilic acid	X	X	X	X	X	X	X	X	X	X
Arsenate, Calcium	X	X	X	X	X	X	X	X	X	X
Arsenate, Copper	X	X	X	X	X	X	X	X	X	X
Arsenate, Lead	X	X	X	X	X	X	X	X	X	X
Arsenate, Magnesium	X	X	X	X	X	X	X	X	X	X
Arsenate, Sodium	X	X	X	X	X	X	X	X	X	X
Arsenic	X	X	X	X	X	X	X	X	X	X

¹ Analysis done by contractor.

NATIONAL RESIDUE PROGRAM--
COMPOUNDS INCLUDED

Compounds/Years	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Atrazine				X	X	X				X
Benomyl									X	
BHC	X	X	X	X	X	X	X	X	X	X
Bufencarb								X	X	X
Cacodylic acid	X	X	X	X	X	X	X	X	X	
Cadmium	X			X	X	X	X		X	X
Cambendazole									X	
Captan									X	
Carbadox	X	X	X	X	X			X	X	X
Carbarsone	X	X	X	X	X	X	X	X	X	
Carbaryl								X	X	X
Carbofuran								X	X	X
Carbophenothion									X	
Chloramphenicol		X	X	X	X	X	X	X	X	X
Chloramphenicol palmitate		X	X	X	X	X	X	X	X	X
Chlordane (technical)	X	X	X	X	X	X	X	X	X	X
Chlordecone									X	

NATIONAL RESIDUE PROGRAM--
COMPOUNDS INCLUDED

Compounds/Years	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
2-Chloro-1-(2,4-dichlorophenyl)vinyl diethyl phosphate									X	X
2-Chloro-1-(2,4,5-trichlorophenyl)vinyl dimethyl phosphate						X	X	X	X	X
Chlorpyrifos	X	X	X	X		X	X	X	X	X
Chlortetracycline bisulfate	X	X	X	X	X	X	X	X	X	X
Chlortetracycline hydrochloride	X	X	X	X	X	X	X	X	X	X
Clopidol							X			
Clorsulon							X	X	X	X
Cloxacillin, Benzathine	X	X	X	X	X	X	X	X	X	
Cloxacillin, Sodium	X	X	X	X	X	X	X	X	X	
Cobalt	X			X	X	X	X		X	X
Copper	X			X	X	X	X		X	X
Coumaphos and oxygen analog	X	X	X	X		X	X	X	X	X
Cruformate	X	X	X	X		X	X	X		X
Cyromazine					X	X	X	X	X	X

NATIONAL RESIDUE PROGRAM--
COMPOUNDS INCLUDED

Compounds/Years	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
DDE (metabolite of DDT)	X	X	X	X	X	X	X	X	X	X
DDT	X	X	X	X	X	X	X	X	X	X
Decoquinat				X	X		X	X	X	
Diazinon	X	X	X	X		X	X	X		X
Dibutyltin dilaurate			X						X	X
Dichlorvos	X	X	X	X		X	X	X		X
Dieldrin	X	X	X	X	X	X	X	X	X	X
O, O-Diethyl S-(2-(ethylthio)ethyl) phosphorodithioate	X	X	X	X		X	X	X		
Diethylstilbestrol	X	X	X	X	X	X	X	X	X	X
Dihydrostreptomycin	X	X	X	X	X	X	X	X	X	
3,5-Dimethyl-4-(methylthio)phenyl methylcarbamate								X	X	
Dioxathion	X	X				X	X	X		
Dodecachloroocta-1,3,4-metheno-2H-cyclobuta(cd)pentale	X	X	X	X	X	X	X	X	X	X

NATIONAL RESIDUE PROGRAM--
COMPOUNDS INCLUDED

Compounds/Years	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Endosulfan										X
Endrin	X	X	X	X	X	X	X	X	X	X
Erythromycin	X	X	X	X	X	X	X	X	X	X
Erythromycin phosphate	X	X	X	X	X	X	X	X	X	X
Erythromycin thiocyanate	X	X	X	X	X	X	X	X	X	X
Ethion and oxygen analog	X	X	X	X		X	X	X		X
Ethylene dibromide				X	X	X				
Fenbendazole					X	X	X	X	X	X
Fenitrothion	X	X	X	X		X	X	X		X
Fenthion	X	X	X	X		X	X	X		
Gentamicin sulfate					X	X	X	X	X	X
Halofuginone							X	X	X	X
HCB	X	X	X	X	X	X	X	X	X	X
Heptachlor and heptachlor epoxide	X	X	X	X	X	X	X	X	X	X
Hetacillin, Potassium	X	X	X	X	X	X	X	X	X	X

NATIONAL RESIDUE PROGRAM--
COMPOUNDS INCLUDED

Compounds/Years	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
5-Hydroxythiabendazole									X	X
Ipronidazole					X	X	X	X	X	X
Ipronidazole hydrochloride					X	X	X	X	X	X
Iron				X	X	X	X		X	X
Ivermectin					X	X	X	X	X	X
Lasalocid				X	X	X				
Lead	X				X	X	X		X	X
Levamisole hydrochloride					X	X	X			
Levamisole phosphate					X	X	X			
Lincomycin							X	X	X	X
Lindane	X	X	X	X	X	X	X	X	X	X
Linuron									X	
Malathion	X	X	X	X		X	X	X	X	X
Manganese	X			X	X	X	X		X	
Mebendazole							X	X	X	X
Melengestrol acetate	X	X	X	X				X	X	X
Mercury	X				X					

NATIONAL RESIDUE PROGRAM--
COMPOUNDS INCLUDED

Compounds/Years	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Methanearsonic acid	X	X	X	X	X	X	X	X	X	X
Methomyl								X	X	X
Methoxychlor	X	X	X	X	X	X	X	X	X	X
Methyl parathion	X	X	X	X		X	X	X		X
Monensin	X	X	X	X	X	X				
Morantel tartrate				X	X	X				
Neomycin sulfate	X	X	X	X	X	X	X	X	X	X
Nicarbazin										X
Nickel	X			X	X	X	X		X	X
Nonachlor	X	X	X	X	X	X	X	X	X	X
Novobiocin						X	X	X	X	X
Oxfendazole							X	X	X	X
Oxytetracycline hydrochloride	X	X	X	X	X	X	X	X	X	X
Parathion	X	X	X	X		X	X	X		X
PBB's			X	X						
PCB's	X	X	X	X	X	X	X	X	X	X
Penicillin, procaine and procaine G	X	X	X	X	X	X	X	X	X	X

NATIONAL RESIDUE PROGRAM--
COMPOUNDS INCLUDED

Compounds/Years	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Penicillin G (benzathine, free acid, sodium salt and procaine salts)	X	X	X	X	X	X	X	X	X	X
Pentachlorophenol		X	X	X	X	X	X			
Phosalone									X	X
Potassium arsenite	X	X	X	X	X	X	X	X	X	X
Propazine				X	X	X				X
Pyrantel tartrate				X	X	X				
Ronnel	X	X	X	X		X	X	X	X	X
Roxarsone	X	X	X	X	X	X	X	X	X	X
Simazine				X	X	X				X
Selenium					X					
Sodium arsenite	X	X	X	X	X	X	X	X	X	X
Streptomycin	X	X	X	X	X	X	X	X	X	X
Sulfabromomethazine sodium	X	X	X	X	X	X	X	X	X	X
Sulfachlorpyridazine					X	X	X	X	X	X
Sulfadimethoxine	X	X	X	X	X	X	X	X	X	X

NATIONAL RESIDUE PROGRAM--
COMPOUNDS INCLUDED

Compounds/Years	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Sulfaethoxypyridazine					X	X	X	X	X	X
Sulfamethazine	X	X	X	X	X	X	X	X	X	X
Sulfamethoxypyridazine					X	X	X	X	X	X
Sulfapyridine	X	X	X	X	X	X	X	X	X	X
Sulfaquinoxaline	X	X	X	X	X	X	X	X	X	X
Sulfathiazole	X	X	X	X	X	X	X	X	X	X
Taleranol (metabolite of zeranol)										X
TDE (metabolite of DDT)	X	X	X	X	X	X	X	X	X	X
TDE (or DDD)	X	X	X	X	X	X	X	X	X	X
Terbutylazine				X	X	X				X
Terpene polychlorinates	X	X	X	X	X	X	X	X	X	X
Tetracycline hydrochloride	X	X	X	X	X	X	X	X	X	X
Thiabendazole						X	X	X	X	X
Tin									X	X
Toxaphene	X	X	X	X	X	X	X	X	X	X
Trichlorfon	X	X	X	X		X	X	X		
Tylosin					X	X	X	X	X	X

NATIONAL RESIDUE PROGRAM--
COMPOUNDS INCLUDED

Compounds/Years	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Virginiamycin						X	X	X	X	X
Zeranol						X	X	X	X	X
Zinc	X			X	X	X	X		X	X

Section 5

NATIONAL RESIDUE PROGRAM (NRP) PLAN--INTRODUCTION

Residue testing of animals slaughtered in the United States is divided into three major activities: monitoring, surveillance, and exploratory projects.

Monitoring is designed to provide profile information on the occurrence of residue violations in specified animal populations on an annual, national basis. Because the primary concern of monitoring is violations, the compounds considered for monitoring generally have established safe limits--tolerances or action levels. Compounds are selected for monitoring based on risk profiles and the availability of laboratory methodology that is suitable for regulatory purposes. Monitoring information is obtained through a statistically-based selection of random samples from healthy-appearing animals under inspection; area monitoring may be conducted where a localized potential problem appears. The information generated from monitoring is reviewed periodically to assist in the allocation of Agency resources.

In addition to profile information, monitoring provides a basis for further action. In particular, the results are used to identify producers marketing animals with violative concentrations of residues. When such producers subsequently offer animals for slaughter, the animals will be subjected to surveillance sampling and testing until compliance is demonstrated. Other auxiliary uses of the data are to indicate prevalence and concentrations of residues, to evaluate residue trends, and to identify problems within the industry for which educational or other corrective efforts may be needed. Thus monitoring not only gathers information, but also assists in deterring practices that lead to violative residues.

Monitoring samples collected by inspectors at slaughtering plants are sent for analysis either to one of three Food Safety and Inspection Service (FSIS) field laboratories or, as needed, to a laboratory under contract to FSIS. The results are usually reported within eight days after arrival at the laboratory. In most cases, the product will have passed into consumer channels and become untraceable. Because of this pragmatic limitation, some animals containing violative residues inevitably pass into consumer channels, in spite of the agency's efforts to limit this occurrence as much as possible. The consequences to human health, however, are minimal as long as the violative rate is low. Tolerances and action levels represent the maximum residue concentrations safe for daily consumption over a lifetime. Occasional consumption of products with slightly higher residues is unlikely to result in adverse health effects.

Surveillance is designed to investigate and control the movement of potentially adulterated products. The sampling is often purposely biased and is directed at particular carcasses or products in response to information from monitoring or other sources (e.g., industry members or a state agency), or from observations during ante-mortem or post-mortem inspection indicating that adulterating concentrations of residue may be present. In-plant testing procedures may be performed by the inspector, or samples may be submitted to an FSIS laboratory for analysis. Depending upon the weight of evidence that led to the testing, product may be retained until test results indicate the appropriate regulatory disposition. Laboratory testing of surveillance samples is completed as rapidly as possible and takes precedence over monitoring samples.

The 1990 NRP plan estimates the surveillance samples anticipated on the basis of historical data; however, the actual number required depends entirely upon the needs that arise. A major incident, such as the 1979 polychlorinated biphenyls (PCB's) contamination problem, could drastically alter the expected surveillance requirement and may require an adjustment of the monitoring plan.

NATIONAL RESIDUE PROGRAM (NRP) PLAN--INTRODUCTION

Exploratory projects are conducted for a variety of reasons, but these activities, whatever their objective, have in common the fact that test results normally are not used to take regulatory action or to trigger follow-up surveillance testing. The design of an exploratory project is not suitable for this purpose.

Exploratory projects generally fall within the following two types:

Studies of the occurrence of residues for which no safe limits (i.e., tolerances or action levels) have been established

There are many chemicals (e.g., trace metals, industrial chemicals, and mycotoxins) that may be inadvertently present in animals yet have no established safe concentrations. Their consistent presence in food (and the resulting need for a tolerance or action level to protect public health) has not been established. FSIS may conduct studies to develop information on the frequency and concentrations at which such residues occur.

These studies may be nationwide or limited to specific geographic areas. Sample collection may be random and statistically based, or biased to obtain "worst case" information. The results are given either to the Food and Drug Administration (FDA) or the Environmental Protection Agency (EPA), which have responsibility for establishing tolerances for contaminants in food under the Federal Food, Drug and Cosmetic Act. Exploratory programs planned on a limited scale may be expanded if preliminary results cause greater concern and make acquiring comprehensive information more urgent.

Other projects as appropriate

These may be designed for various purposes, such as evaluating new methods and approaches to monitoring, or supplementing the information used in considering a compound for monitoring.

Domestic Quality Assurance

The Agency enters into "memorandums of understanding" with segments of the meat and poultry industry to provide assurance that when the animals are presented for slaughter they do not contain violative concentrations of chemical residues. This assurance is based both on reviewing records of critical control points in pre-slaughter management control programs and on residue testing in USDA-accredited laboratories. Because of this control and testing program at critical control points, these animals may be sampled under Quality Assurance sampling rather than under monitoring.

Import Program

Testing of meat and meat products imported into the United States is a means of verifying the effectiveness both of an exporting country's residue control program and of the program review process maintained by FSIS. It is a final assurance that an exporting country's products meet the same standard applied to products produced in the United States. When test results indicate a violative concentration of residues in an imported product, subsequent shipments of the same product group from the establishment are retained at the port of entry until laboratory results are known. If results are negative, suspect product is permitted to move into commerce; if positive, suspect product is not permitted to move into commerce. All shipments of product from that country are placed on an increased testing schedule until a record of compliance is re-established for the country. Similar principles are followed in collecting samples for the domestic and foreign testing programs. Compounds selected for residue testing in one program closely parallel those chosen for the other.

NATIONAL RESIDUE PROGRAM (NRP) PLAN--INTRODUCTION

Annual Plan

The development of the yearly NRP Plan begins in February of the preceding year and progresses by means of discussions, both formal and informal, among the Residue Evaluation and Planning Division of the FSIS Science and Technology Program, other Science and Technology Divisions, other FSIS programs, and involved Federal Agencies; it culminates in formal reviews by FSIS and an interagency working group during the late summer and fall. The plan is based on a "residue/species pair" design concept. The species or production-class groups paired with residues are determined by commonalities in rearing as these factors affect the animal's exposure and the probability that residues may be present at slaughter. For example, market hogs have an exposure-potential profile different from that of boars and sows.

In 1983 FSIS asked the Food and Nutrition Board of the National Research Council (NRC) to evaluate the scientific basis of the present system for inspecting meat and poultry and meat and poultry products; an assessment of the National Residue Program was included in the request. The NRC report, "Meat and Poultry Inspection: The Scientific Basis of the Nation's Program," was published on July 16, 1985. It contained a number of recommendations and described the characteristics of an ideal program. During fiscal year 1986, FSIS considered the mission and design of the residue program in terms of the NRC report. This review influenced portions of the 1986 plan and has had an additional impact on the 1987, 1988, 1989, and 1990 plans.

Although the projections upon which the plan is based are as exact as possible, they may not match budgetary or facility resources, or specific sampling and analytical capabilities or requirements during 1990. Residue control is a dynamic field, with continual change; the plan will be modified during the year as additional information alters the original assessment.

The following describes the tables in which the details of the plan are presented. Preceding the tables is an alphabetical list (with explanatory material) of the compounds included in the 1990 plan.

Table I

Table I lists the compounds included in the 1990 plan, the ranking assigned, and the residue designation used in the plan. The residue designation identifies the class of compounds detected by the initial analytical procedure. For example, "arsenic" includes several arsenical compounds.

The analytical methods used, the minimal levels of measurement that can be achieved, and references to full descriptions of the methods can be found in the Analytical Capability section of this document. FSIS maintains a laboratory development and quality assurance program to ensure progress in residue testing and the integrity of its test results. Before an analyst is allowed to conduct a test on a monitoring or surveillance sample, he or she must demonstrate adequate proficiency and meet specified standards in analyzing quality-assurance samples. (Additional information on the quality-assurance program can be obtained from the Chemistry Division's Quality Assurance Handbook.)

Whenever possible, multi-residue methods are used to detect the presence of more than one residue in a sample; such procedures are used for chlorinated hydrocarbons, antibiotics, sulfonamides, and other classes of compounds. Some of the multi-residue methods detect the presence of additional compounds not included in this listing; however, the confirmation of identity or precise quantification of these additional residues may or may not be possible. Some compounds that are not significant public health concerns may be included because they are detected in multi-residue testing procedures. The multi-residue methods and the number of compounds that may be identified by each method are expanded when new or modified technology is available.

NATIONAL RESIDUE PROGRAM (NRP) PLAN--INTRODUCTION

Table II

Table II lists the species or production-class groups normally used for a residue/species pair in a statistical design and the apportionment of samples between production classes. Exceptions to the groupings for particular compounds are made when appropriate.

Table III

The number of samples for a given residue/species pair generally is chosen to ensure detection of a problem that affects a specified percentage of the population. Table III shows the relationships among the sample size required to detect a problem, the size of the problem, and the probability of detection. The number of samples generally is chosen to provide a 95% probability of detecting at least one violation when one percent of the animal population sampled is violative. This requires approximately 300 samples. Ensuring a 95% probability of detecting a problem that affects 0.1 percent of the sampled population would require increasing the number of samples to approximately 3,000. When it is known or anticipated that a residue presents a significant public health problem, sampling may be increased. The increased sampling permits study of trends and geographic or seasonal variation in violation rates, and may aid in preparing effective control actions. Contrarily, sample sets of fewer than 300 samples are appropriate when at least one of the following conditions pertains: a minor species is involved; it is known that the prevalence of residues in the species involved is low or apparently nonexistent; slaughter of the species occurs in only a few establishments; cost savings or more urgent demands necessitate the reduction of sampling or laboratory resources.

Collection requests for samples are generated monthly, using an FSIS computerized system in Washington, D.C. Sample and plant selection is random and statistically (probability) based, with a minimal bias. Normally, residues are monitored for the entire year, but some may be introduced during the year and may continue into the following year. Others may be included only during a particular period of the year. Variables such as production volume, geography, and season are addressed statistically within resource constraints. In some cases where method development is incomplete, samples will be collected on a monthly basis but analytical work may be delayed until the methods are implemented.

Table IV

Table IV lists the tissues to be collected for domestic and import sample analysis.

Table V

Table V presents a summary of the combined domestic and import plans. The plans specify the sample units planned for analysis. In the domestic program a livestock sample unit represents one animal. With poultry, a sample unit can be from one animal when the target tissue is a large one such as fat or muscle or the liver in turkeys. In some cases, the target tissue, such as the liver in chicken, is too small to produce an adequate sample. A poultry sample can then be composed by commingling tissues from six birds.

Table VI

In themselves, sample numbers are not good indicators of the actual commitment of resources, or of the effectiveness of these commitments. Table VI illustrates the wide divergence among test procedures in amount of analyst time required per sample.

Table VII

Table VII presents the domestic program sample units planned for 1990, including monitoring, surveillance, and exploratory activities.

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NATIONAL RESIDUE PROGRAM (NRP) PLAN--INTRODUCTION

Tables VIII-IX

Tables VIII and IX show the monitoring and exploratory sample units planned for domestic livestock and poultry, respectively. The sample unit numbers for each residue designation are dispersed according to species.

Table X

Table X presents the sample plan for imported products. The design of the import plan differs from the domestic plan because it involves the reinspection of product that has already been inspected under an approved foreign system with a residue program equal to that of the U.S. Thus port-of-entry residue sampling is intended to provide further information on the operation of the foreign system's residue controls.

The import inspection program uses an Automated Import Information System (AIIS) to direct the selection of samples from any port where product may arrive. Data stored in the AIIS are used for monthly updates of the sampling requirements for each country, product, and residue class, to ensure that the commitments of the annual plan are met. Appropriate changes can be made in the AIIS if, during the course of the year, there are unexpected changes in the volume or type of imported product from any country or countries.

Tables XI-XII

Table XI shows the planned import samples by species and Table XII shows estimated analyses per country.

Table XIII

Table XIII shows how the sampling rates are determined. Volume of products exported to the U.S. is factored into a formula to yield a "starting point" number. This number is modified according to a compound's evaluation and ranking, and FSIS laboratory capabilities.

Tables XIV-XXIII

Table XIV shows the estimated annual volume of imported beef, divided into fresh (including frozen) and cured/cooked products. Table XV lists the monitoring and exploratory sample unit analyses planned for fresh and cooked/cured beef products. Tables XVI and XVII follow the same procedure for imported pork; Tables XVIII and XIX for fresh veal, mutton, and lamb; Tables XX and XXI for ducks/geese and turkeys; and Tables XXII and XXIII for chickens and goats.

COMPOUNDS INCLUDED IN THE 1990 RESIDUE PLAN

Antibiotics

During the last decade antibiotic use in food animals, as in human medicine, has been increasingly directed against specific conditions and less toward general therapy or disease prevention. Nevertheless, some antibiotics continue to be fed at subtherapeutic concentrations to enhance feed efficiency and promote growth.

The antibiotics vary widely in their toxicity, safe residue concentrations, and required withdrawal periods. Toxic effects include, for example, life-threatening hypersensitivity responses (penicillins) and hearing impairment (streptomycins). In addition, there is concern about the development and transmission of pathogenic organisms resistant to antibiotic therapy.

A multitude of antibiotics are detected by the screening tests used for 1990 monitoring activities. The conventional bioassays and ELISA's currently in use will identify penicillins, streptomycins, tetracyclines, chloramphenicol, neomycin, erythromycin, gentamicin, and tylosin.

Calves have presented a high percentage of violative antibiotic residues. Until 1987, calves were sampled as a single class. In 1988 calves tested under surveillance were divided into four groups: bob (up to 3 weeks of age or 150 pounds in weight); formula-fed calves between 150 and 400 pounds; non-formula calves between 150 and 400 pounds; and heavy calves (over 400 pounds). During 1990, calves will be monitored in these separate classes. Formula-fed calves are a problem because they are slaughtered at three or four months and may retain residues of some long-acting antibiotics in their kidneys or other tissues.

Bob calves present an acute problem, as they are slaughtered before many drugs that might be administered can deplete to safe concentrations. FSIS conducts an intensive in-plant testing program--the Calf Antibiotic and Sulfonamide Test (CAST) program--directed at violative antibiotic and sulfonamide residues in bob calves.

Cows presented for slaughter are usually culled from beef or dairy herds for substandard performance and may have been treated before slaughter. Consequently, cows also have had a relatively high percentage of violative residues. Since cows are often presented for slaughter singly or in small lots, it has proved difficult to trace violative carcasses found in monitoring to their place of origin for follow-up surveillance testing. FSIS has an active in-plant testing program for cows suspected of containing violative residues--the Swab Test on Premises (STOP) program--that has been effective over the years in reducing the previously very high violation rate in this vulnerable group of animals. All cows sampled under the national monitoring program will be concurrently screened by the STOP test. Carcasses that are STOP-positive will be retained pending confirmation of adulteration by laboratory analysis. Before 1989 both beef and dairy cows were grouped together with bulls as a single production class; in 1990 dairy cows will be sampled separately from beef cows, and control measures will be developed in response to any specific problems.

During 1990 all sampled horses are to be screened in-plant by the STOP test; if the horse is STOP-positive, the carcass will be retained pending confirmation of adulteration by laboratory analysis. Additional surveillance sampling may be added to a particular plant that has a greater occurrence of adulterated animals. All fresh imported product will be sampled and tested for antibiotics in 1990.

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COMPOUNDS INCLUDED IN THE 1990 RESIDUE PLAN

Arsenic

Compounds containing arsenic are monitored by a method that measures total arsenic (see Table I). Organic arsenical compounds, either alone or combined with other compounds, have been widely used both in humans and in food-producing animals as tonics, restoratives, nutrients, herbicides, pesticides, protozoal and helminthologic agents, antimicrobials, and growth promoters. They are approved for use in chickens as growth promoters and, in conjunction with other compounds, as coccidiostats; they are used in swine as growth promoters and to prevent bacterial enteritis.

When arsenicals are used as approved in chickens and swine, the animals or birds must not be treated with or exposed to the arsenical compounds within five days of slaughter. This five-day withdrawal period is sufficient to ensure that concentrations of arsenic in the tissues are lower than the tolerance concentrations.

There is information linking inorganic arsenicals to skin, lung, and liver cancer. Information on the classes of organic arsenical compounds being used in food animal production indicates that these compounds do not have carcinogenic or irritant effects.

Arsenic is included in the domestic monitoring plan for horses, cows, goats, market hogs and young chickens and turkeys. In 1990, sampling will be increased because of arsenic found in CCA-treated wood that may be used for construction in animal enclosures. The imported products to be tested for the presence of arsenic include pork, goats, fresh turkeys and cooked turkey products, and fresh chickens and processed chicken products.

Benzimidazoles

The eight compounds included in the benzimidazoles and detected by FSIS's current laboratory procedures are albendazole, benomyl, cambendazole, fenbendazole, mebendazole, oxfendazole, and thiabendazole and its 5-hydroxy metabolite. These compounds are variously used as pesticides, and as anthelmintics in several species for treatment of gastrointestinal or lung worms.

Undesirable side effects frequently encountered in human beings treated with benzimidazoles are anorexia, nausea, vomiting, and dizziness. Less frequently noticed are diarrhea, epigastric distress, drowsiness, and headache.

In 1990, cattle, sheep, lambs, goats, market hogs, and young chickens will be tested for benzimidazoles. Imported beef, veal, pork, mutton, and lamb will also be sampled and tested for these compounds.

Carbadox

Carbadox is approved for use in swine weighing less than 75 pounds to prevent or treat enteritis and for increased feed efficiency and weight gain. The last exposure of swine to carbadox must be at least 10 weeks before slaughter. The parent compound is a liver carcinogen. In 1990, domestic market hogs, boars, and sows will be monitored, and 300 surveillance sample unit analyses are projected to test for the presence of carbadox in roaster pigs. As carbadox is approved in other countries for use with swine, it is included in the import plan for pork.

Carbamates

Carbamates are primarily systemic insecticides and acaricides but are also used extensively as soil treatments and as topical and knockdown agents for ectoparasites and other pests. Carbamates are cholinesterase inhibitors and are generally neurotoxic. Symptoms of toxicity include nausea, vomiting, diarrhea, and dyspnea.

Analysis for carbamates includes ten compounds: aldicarb, two aldicarb metabolites, bufencarb, carbaryl, carbofuran and its metabolite 3-hydroxycarbofuran, 3,5-Dimethyl-4-(methylthio)phenyl methylcarbamate and its metabolite, and methomyl. During 1990, 1,300 domestic monitoring samples from dairy cows, veal calves, and ducks will be analyzed for these carbamates.

Chloramphenicol

Chloramphenicol is a potent, rapidly metabolized, and toxic antibiotic with a wide spectrum of effectiveness. Chloramphenicol is not approved for use in food animals, and its use is restricted in humans because of its association with blood dyscrasias that are sometimes fatal.

During 1990, more than 3,800 sample unit analyses from domestic and imported product are scheduled.

Chlorinated Hydrocarbons and Organophosphates (CHC/COP's)

FSIS laboratories use multi-residue screening and confirmatory analytical procedures to identify aldrin, captan, chlordecone, endosulfan, endrin, dieldrin, BHC, chlordane, heptachlor and heptachlor epoxide, DDE, DDT, TDE, HCB, lindane, linuron, methoxychlor, nonachlor, PCB's, dodecachlorooctahydro-1,3,4-metheno-2H-cyclobuta[cd]pentalene, terpene polychlorinates, and toxaphene.

Most of these compounds are potent and persistent pesticides the use of which has been discontinued or severely restricted because of their suspected carcinogenicity in some species, their effect on egg shell production (especially in predatory fowl), and their characteristic propensity to accumulate in the food chain. Accumulation of chlorinated hydrocarbons in body fat may result in concentrations 10 to 30 times as great as in the food supply. Metabolism and excretion are slow, and the biological half-life of these compounds may be several months in mammals and several years in arid soils. Their persistence and potency make them effective as long-term insecticides but also cause their continuing though diminishing occurrence as residues in meat and poultry products.

In 1987 the chlorinated hydrocarbon method was modified slightly to include residues in fat from a group of chlorinated organophosphates. With no additional sample collection, the domestic samples tested for chlorinated hydrocarbons yield results for seven chlorinated organophosphates: carbophenothion, 2-chloro-1-(2,4-dichlorophenyl)vinyl diethyl phosphate, 2-chloro-1-(2,4,5-trichlorophenyl)vinyl dimethyl phosphate, chlorpyrifos, coumaphos, phosalone, and ronnel.

During 1990, analysis for residues of chlorinated hydrocarbons is planned for all domestic and imported species and production classes.

Cyromazine

Cyromazine (Larvadex) is an insect growth regulator that is highly effective in preventing the development of diptera larvae in livestock and poultry manure; it is recommended for use in poultry feed to control flies in the droppings of laying hens. In the U.S. cyromazine is approved for use in

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COMPOUNDS INCLUDED IN THE 1990 RESIDUE PLAN

laying hens only, but it is used in livestock in some countries. High doses of a metabolic breakdown product of cyromazine, melamine, resulted in bladder tumors in rats. These tumors, however, are thought to result from mechanical irritation caused by bladder stones formed at high dosage concentrations, and not from the intrinsic carcinogenicity of melamine.

In 1985 the current analytical method, re-evaluated with a considerably lower limit of sensitivity, was installed in the Field Services Laboratories. During 1986 testing with the new method was started in cattle and chickens at the lower detection limit and in 1987 was expanded to include sheep and goats. Samples are collected only during the fly season, from February through September in the Southeastern and Southwestern regions, beginning in March in the Western region, and in May in the Northeastern and North Central regions. There will be 1,850 sample unit analyses for the presence of cyromazine in domestic product in 1990.

Cyromazine is included in the import residue plan for beef, mutton, lamb, goats, and poultry.

DES

Diethylstilbestrol (DES) is an estrogenic compound once approved for use to increase feed efficiency and the rate of weight gain. DES was banned from use in 1979 when it was linked to cancer in humans. Some illegal use was detected in fancy veal calves in 1981.

Domestic monitoring activities for DES include 1,200 samples from calves, 300 from lambs, and 300 samples from domestic heifers and steers. Imported beef and veal will be sampled for DES.

Dibutyltin dilaurate

Dibutyltin dilaurate, a compound of concern to the residue program (CES ranking of A-1), is a drug approved for use with growing turkeys and chickens. It is used alone in turkeys for coccidiosis and hexamitiasis, or in combination with other compounds as an anthelmintic for chickens and turkeys. The withdrawal time is 28 days. Dibutyltin dilaurate is an immunosuppressant and suspect carcinogen in experimental animals.

A component of dibutyltin dilaurate is tin, which is the analyte measured by the methods used for this compound. (A method that specifically identifies a dibutyltin moiety has now been developed.) In 1988 and 1989 exploratory samples were analyzed for tin. Approximately one-fifth of the samples contained more tin than would be expected from background sources, in some cases considerably more. This excess could not be definitely characterized as a residue from dibutyltin dilaurate or a pesticide or as a leachate from containers. It could not be determined if the excess derived from organic sources.

In 1990, 600 monitoring samples from young turkeys will be analyzed for tin. All fresh imported poultry will be sampled for dibutyltin dilaurate.

Gentian violet

Gentian violet is a triphenylmethane (rosaniline) dye that is bacteriostatic and bactericidal to gram-positive bacteria and to many fungi. 600 sample unit analyses are projected during 1990 for mature chickens and young turkeys.

COMPOUNDS INCLUDED IN THE 1990 RESIDUE PLAN

Halofuginone

Halofuginone is a coccidiostat for young chickens and young turkeys. In higher doses halofuginone is a growth depressant, impairs feed utilization, and reduces feed intake. In rats it causes alopecia. The compound is prohibited from use during the last four days before slaughter (withdrawal period). Domestic and imported young chickens and turkeys will be monitored for halofuginone in 1990.

Ivermectin

Ivermectin is a macrocyclic lactose compound active at extremely low doses against a wide variety of nematode and arthropod parasites. Ivermectin is teratogenic in the rat, rabbit, and mouse. Most domestic livestock species will be monitored for ivermectin.

Melengestrol acetate

Melengestrol acetate (MGA) is a progestational agent added to the feed of heifers to suppress estrus and thereby achieve an increase in feed efficiency and the rate of weight gain. It is regulated as a suspect carcinogen in feedlot heifers. Domestic heifers and beef imported from Canada will be sampled for MGA in 1990.

Nicarbazin

Nicarbazin is a coccidiostat used in young and mature chickens. In 1990, 600 domestic samples will be tested for nicarbazin.

Nitroimidazoles

A nitroimidazole (ipronidazole) was previously approved for domestic use to control blackhead in turkeys and in other countries to treat or prevent enteritis in swine. Although ipronidazole is not approved for use in swine in the United States, some misuse in swine may occur in the U.S. and thus could result in illegal residues. It is a suspect carcinogen in experimental animals.

In 1990, samples for the nitroimidazoles (ipronidazole and dimetridazole) will be collected from imported pork and turkeys. Also, the nitroimidazole screen will be used to detect the presence of nitroimidazoles in domestic swine and young turkeys.

Organophosphates

Organophosphate insecticides are widely used in crop production to combat a great variety of insects. They are also used in topical treatments of animals to control grubs and flies and are approved for use as animal drugs to control gastrointestinal roundworms. The organophosphates generally are far less persistent than the chlorinated hydrocarbon insecticides, although withdrawal periods are required after direct treatment of animals. The primary toxic effect of concern is the inhibition of cholinesterase, a key enzyme in regulating the nervous system.

In 1987 the chlorinated hydrocarbon method was modified slightly to include residues in fat from a group of chlorinated organophosphates. The analyses of domestic sample units performed for these chlorinated organophosphates are now listed under Chlorinated Hydrocarbons and Organophosphates (CHC/COP's). Previous domestic monitoring, which has involved analysis of liver tissue from all species, has not shown any problems. All domestic species/production groups will be monitored for the seven chlorinated organophosphates in 1990.

The traditional organophosphate procedure will be conducted on muscle tissue samples of imported beef, as the chlorinated organophosphate procedure is not appropriate for low-fat samples.

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COMPOUNDS INCLUDED IN THE 1990 RESIDUE PLAN

Pyrethrins

Pyrethrins are a group of natural insecticides obtained chiefly from the flowers of *Crysanthemum cinerariaefolium*. These compounds are used widely because their mammalian toxicity is low relative to their insecticidal properties. Pyrethroids, for example, permethrin, are produced synthetically to mimic the biological activities of the natural pyrethrins.

The 1990 domestic monitoring program will include sampling of dairy cows and formula-fed calves for cyano (3-phenoxyphenyl) methyl-4-chloro-a-(methylethyl) benzeneacetate, cypermethrin, deltamethrin, flucythrinate, and permethrin.

Sulfonamides

Sulfonamides are bacterial and protozoal suppressant agents that have been widely used in animals and humans since the early 1940's. They continue to be popular because of their economic advantages and wide spectrum of activity. Toxic effects include renal damage, thyroid degeneration, and allergy. FSIS uses a multi-residue method of analysis for sulfonamides that can determine residues of sulfabromomethazine, sulfachlorpyridazine, sulfadiazine, sulfadimethoxine, sulfadoxine, sulfaethoxypyridazine, sulfamethazine, sulfamethoxypyridazine, sulfaphenazole, sulfapyridine, sulfaquinoxaline, sulfathiazole, sulfatroxazole, and sulfoxazole.

Domestic monitoring samples are planned for 1990 in all relevant species/production groups. Monitoring samples from market hogs will be increased to 3,600 so as to provide monthly estimates of the frequency of violative concentrations. In the import plan, all commodities will be sampled for sulfonamide testing.

Triazines

The four herbicides included in the FSIS triazines method are atrazine (no-till corn and sorghum), propazine (sorghum), simazine (grass), and terbuthylazine (weeds in potato and cereal crops). These compounds are moderately persistent in soil; they are absorbed by the roots of plants and transported into the foliage, where they can be ingested by livestock. Regulations restrict grazing of treated areas for 60 to 90 days after application. Reports about the carcinogenicity of the triazines are mixed. Teratogenic effects have been reported in some cases.

In 1990 domestic sheep, lambs, and goats will be sampled and tested for triazines.

Table I
COMPOUNDS INCLUDED IN THE
1990 RESIDUE PLAN

Compound(s)	Ranking	Residue Designation Used in Plan ¹
Albendazole	A-2	Benzimidazoles
Aldicarb	A-4	Carbamates
Aldrin	A-3	CHC/COP's
Amoxicillin trihydrate	B	Antibiotics
Ampicillin	B-2	Antibiotics
Apramycin	D	Apramycin
Arsanilate sodium	A	Arsenic
Arsanilic acid	C-1	Arsenic
Arsenate, calcium	C	Arsenic
Arsenate, copper	D	Arsenic
Arsenate, lead	D	Arsenic
Arsenate, magnesium	D	Arsenic
Arsenate, sodium	D	Arsenic
Arsenic	A	Arsenic
Atrazine	C-3	Triazines
Bacitracin methylene disalicylate	C	Antibiotics
Bacitracin zinc	C	Antibiotics
Benomyl	B-3	Benzimidazoles
BHC	B-2	CHC/COP's
Bufencarb	D	Carbamates
Cambendazole	B	Benzimidazoles
Captan	B-3	CHC/COP's

¹ For planning, FSIS uses a term signifying the compound or group detected by the method used for a planned sample set.

Table I
COMPOUNDS INCLUDED IN THE
1990 RESIDUE PLAN

Compound(s)	Ranking	Residue Designation Used in Plan ¹
Carbadox	A-3	Carbadox
Carbarsone	C-2	Arsenic
Carbaryl	B-2	Carbamates
Carbofuran	C-3	Carbamates
Carbophenothion	D	Organophosphates (also CHC/COP's)
Chloramphenicol	A-2	Chloramphenicol
Chloramphenicol palmitate	A-2	Chloramphenicol
Chlordane (technical)	A-2	CHC/COP's
Chlordecone	D	CHC/COP's
2-Chloro-1-(2,4-dichlorophenyl) vinyl diethyl phosphate	D	Organophosphates (also CHC/COP's)
2-Chloro-1-(2,4,5-trichlorophenyl) vinyl dimethyl phosphate	A	Organophosphates (also CHC/COP's)
Chlorpyrifos	B-4	Organophosphates (also CHC/COP's)
Chlortetracycline bisulfate	A	Antibiotics
Chlortetracycline hydrochloride	A	Antibiotics
Cloxacillin, benzathine	B	Antibiotics
Cloxacillin, sodium	B	Antibiotics
Coumaphos and oxygen analog	B-2	Organophosphates (also CHC/COP's)
Cyano (3-phenoxyphenyl) methyl-4-chloro- a-(methyl-ethyl) benzeneacetate	D-3	Pyrethrins

¹ For planning, FSIS uses a term signifying the compound or group detected by the method used for a planned sample set.

Table I
COMPOUNDS INCLUDED IN THE
1990 RESIDUE PLAN

Compound(s)	Ranking	Residue Designation Used in Plan ¹
Crufomate	B	Organophosphates
Cypermethrin	B-3	Pyrethrins
Cyromazine	B-3	Cyromazine
DDE (metabolite of DDT)	A	CHC/COP's
DDT	B-3	CHC/COP's
Deltamethrin	C-4	Pyrethrins
Diazinon	D	Organophosphates
Dibutyltin dilaurate	A-1	Dibutyltin dilaurate
Dichlorvos	B-4	Organophosphates
Dieldrin	A	CHC/COP's
O,O-Diethyl S-[2-(ethylthio)ethyl] phosphorodithioate	A-2	Organophosphates
Diethylstilbestrol	D	DES
Dihydrostreptomycin	A-1	Antibiotics
3,5-Dimethyl-4-(methylsulfinyl) phenyl methylcarbamate	D	Carbamates
3,5-Dimethyl-4-(methylthio) phenyl methylcarbamate	D	Carbamates
Dimetridazole	C	Nitroimidazoles
Dioxathion	D	Organophosphates
Dodecachlorooctahydro-1, 3,4-metheno-2H-cyclobuta [cd]pentalene	A	CHC/COP's

¹ For planning, FSIS uses a term signifying the compound or group detected by the method used for a planned sample set.

Table I
COMPOUNDS INCLUDED IN THE
1990 RESIDUE PLAN

Compound(s)	Ranking	Residue Designation Used in Plan ¹
Endosulfan	D	CHC/COP's
Endrin	A-3	CHC/COP's
Erythromycin	A	Antibiotics
Erythromycin phosphate	A	Antibiotics
Erythromycin thiocyanate	A	Antibiotics
Estradiol benzoate	A	Estrogenic Compounds
Estradiol monopalmitate	A	Estrogenic Compounds
Ethion and oxygen analog	B	Organophosphates
Fenbendazole	B-3	Benzimidazoles
Fenitrothion	D	Organophosphates
Fenthion	C-3	Organophosphates
Flucythrinate	D	Pyrethrins
Gentamicin sulfate	B-2	Antibiotics
Gentian violet	D	Gentian violet
Halofuginone	A-1	Halofuginone
HCB	A-3	CHC/COP's
Heptachlor and heptachlor epoxide	A-1	CHC/COP's
Hetacillin, potassium	B	Antibiotics
3-Hydroxycarbofuran	D	Carbamates
5-Hydroxythiabendazole	A	Benzimidazoles

¹ For planning, FSIS uses a term signifying the compound or group detected by the method used for a planned sample set.

Table I
COMPOUNDS INCLUDED IN THE
1990 RESIDUE PLAN

Compound(s)	Ranking	Residue Designation Used in Plan ¹
Ipronidazole	Z-4	Nitroimidazoles
Ipronidazole hydrochloride	Z-4	Nitroimidazoles
Ivermectin	B-1	Ivermectin
Lincomycin	B	Antibiotics
Lindane	A-2	CHC/COP's
Linuron	A-3	CHC/COP's
Malathion	B	Organophosphates
Mebendazole	B-4	Benzimidazoles
Melengestrol acetate (MGA)	B-4	Melengestrol acetate
Methanearsonic acid	D	Arsenic
Methomyl	D	Carbamates
Methoxychlor	D-4	CHC/COP's
2-Methyl-2-(methylsulfinyl)propionaldehyde O-(methylcarbamoyl) oxime	D	Carbamates
2-Methyl-2-(methylsulfonyl)propionaldehyde O-(methylcarbamoyl) oxime	D	Carbamates
Methyl parathion	D	Organophosphates
Neomycin sulfate	B-3	Antibiotics
Nicarbazin	B-3	Nicarbazin
Nonachlor	D	CHC/COP's
Novobiocin	B	Antibiotics
Oxfendazole	D	Benzimidazoles
Oxytetracycline hydrochloride	A	Antibiotics

For planning, FSIS uses a term signifying the compound or group detected by the method used for a planned sample set.

Table I
COMPOUNDS INCLUDED IN THE
1990 RESIDUE PLAN

Compound(s)	Ranking	Residue Designation Used in Plan¹
Parathion	D	Organophosphates
PCB's	A-4	CHC/COP's
Penicillin, procaine and procaine G	A	Antibiotics
Penicillin G (benzathine, free acid, sodium salt, and procaine salts)	A	Antibiotics
Permethrin	B-2	Pyrethrins
Phosalone	D	Organophosphates (also CHC/COP's)
Propazine	C-4	Triazines
Ronnel	B	Organophosphates (also CHC/COP's)
Roxarsone	C-1	Arsenic
Simazine	C-3	Triazines
Streptomycin	A-3	Antibiotics
Sulfabromomethazine sodium	C	Sulfonamides
Sulfachlorpyridazine	A	Sulfonamides
Sulfadiazine	D	Sulfonamides
Sulfadimethoxine	A	Sulfonamides
Sulfadoxine	D	Sulfonamides
Sulfaethoxypyridazine	A	Sulfonamides
Sulfamethazine	B-1	Sulfonamides
Sulfamethoxypyridazine	D	Sulfonamides
Sulfaphenazole	D	Sulfonamides
Sulfapyridine	D	Sulfonamides

¹ For planning, FSIS uses a term signifying the compound or group detected by the method used for a planned sample set.

Table I
COMPOUNDS INCLUDED IN THE
1990 RESIDUE PLAN

Compound(s)	Ranking	Residue Designation Used in Plan¹
Sulfaquinoxaline	B-1	Sulfonamides
Sulfathiazole	B-1	Sulfonamides
Sulfatroxazole	D	Sulfonamides
Sulfisoxazole	C	Sulfonamides
TDE (metabolite of DDT)	A	CHC/COP's
Terbuthylazine	A	Triazines
Terpene polychlorinates	A	CHC/COP's
Tetracycline hydrochloride	B-3	Antibiotics
Thiabendazole	B-2	Benzimidazoles
Toxaphene	A-2	CHC/COP's
Trichlorfon	B-3	Organophosphates
Tylosin	D-2	Antibiotics
Virginiamycin	D-4	Antibiotics

¹ For planning, FSIS uses a term signifying the compound or group detected by the method used for a planned sample set.

Table II
GROUPS FOR RESIDUE EVALUATION

Species/Production Classes	Apportionment
Horses	
Bulls/Beef Cows	(20%/80%)
Dairy cows	
Heifers/Steers	(40%/60%)
Calves	
<i>Bob</i>	
<i>Formula-fed</i>	
<i>Non-formula</i>	
<i>Heavy</i>	
Sheep/Lamb (Seasonal)	(10%/90%)
Goats	
Hogs, market	
Sows/Boars	(80%/20%)
Chickens, young	
Chickens, mature	
Turkeys, young ¹ (Seasonal)	
Turkeys, mature ² (Seasonal)	
Ducks	
Geese (Seasonal)	
Rabbits	

1 Normally 26 weeks old.

2 Breeding stock.

Table III**NUMBER OF SAMPLES REQUIRED TO ENSURE DETECTION OF A PROBLEM THAT AFFECTS A GIVEN PERCENTAGE OF THE SAMPLED POPULATION**

Percentage Violative in Sampled Population	Probability of Detection (Percent)			
	90	95	99	99.9
	Samples Required			
10	22	29	44	66
5	45	59	90	135
1	230	299	459	688
.5	460	598	919	1,379
.1	2,302	2,995	4,603	6,905
.05	4,605	5,990	9,209	13,813

Table IV
TARGET SAMPLE TISSUES TO BE
COLLECTED FOR ANALYSIS

Residue Designation	Species Sampled	Tissue Analyzed¹
Antibiotics	Cattle	Kidney, liver, muscle²
	Chickens	
	Ducks	
	Geese	
	Goats	
	Horses	
	Rabbits	
	Sheep	
	Swine	
	Turkeys	
Arsenic	Cattle	Liver, muscle
	Chickens	
	Goats	
	Horses	
	Swine	
	Turkeys	
Benzimidazoles	Cattle	Liver, muscle
	Chickens	
	Goats	
	Sheep	
	Swine	
Carbadox	Swine	Liver, muscle
Carbamates	Cattle	Liver, muscle
	Ducks	
Chloramphenicol	Cattle	Kidney, muscle (domestic) Muscle (imports)
Chlorinated Hydrocarbons and Organophosphates (CHC/COP's)	Cattle	Fat
	Chickens	
	Ducks	
	Geese	
	Goats	
	Horses	
	Rabbits	
	Sheep	
	Swine	
	Turkeys	

¹ Tissues in bold-face type submitted for monitoring samples; for surveillance samples, all tissues submitted.

² Liver to be analyzed if kidney is violative; muscle to be analyzed if liver is violative.

Table IV
TARGET SAMPLE TISSUES TO BE
COLLECTED FOR ANALYSIS

Residue Designation	Species Sampled	Tissue Analyzed¹
Cyromazine	Cattle Chickens Goats Sheep Turkeys	Muscle
DES	Cattle Sheep	Liver, muscle
Dibutyltin dilaurate	Turkeys	Liver
Gentian violet	Chickens Turkeys	Fat
Halofuginone	Chickens Turkeys	Liver, muscle
Ivermectin	Cattle Goats Horses Sheep Swine	Liver, muscle
Melengestrol acetate (MGA)	Cattle	Fat, muscle
Nicarbazin	Chickens	Liver
Nitroimidazoles	Swine Turkeys	Muscle
Organophosphates (imports)	Cattle Sheep	Muscle
Pyrethrins	Cattle	Fat
Sulfonamides	Cattle Chickens Ducks Geese Goats Horses Rabbits Sheep Swine Turkeys	Urine, liver, muscle²

1 Tissues in bold-face type submitted for monitoring samples; for surveillance samples, all tissues submitted.

2 Urine submission optional; if urine is positive, then liver is analyzed; if liver is positive, then muscle is analyzed.

Table IV
**TARGET SAMPLE TISSUES TO BE
 COLLECTED FOR ANALYSIS**

Residue Designation	Species Sampled	Tissue Analyzed¹
Triazines	Goats Sheep	Fat, muscle

¹ Tissues in bold-face type submitted for monitoring samples; for surveillance samples, all tissues submitted.

Table V
DOMESTIC AND IMPORT SAMPLE
UNIT ANALYSES--1990

Residue Designation	Domestic	Import	Totals
Antibiotics	20,577	2,717	23,294
Arsenic	2,100	1,309	3,409
Benzimidazoles	2,986	2,365	5,351
Carbadox	1,308	1,413	2,721
Carbamates	1,300	---	1,300
Chloramphenicol	2,000	1,830	3,830
Chlorinated Hydrocarbons and Organophosphates (CHC/COP's)	6,413 ¹	3,988 ²	10,401
Cyromazine (Seasonal)	1,850	1,195	3,045
DES	1,900	185	2,085
Dibutyltin dilaurate	1,500	69	1,569
Gentian violet	600	---	600
Halofuginone	1,300	144	1,444
Ivermectin	4,201	1,491	5,692
Melengestrol acetate	300	150	450
Nicarbazin	600	---	600
Nitroimidazoles	610	1,239	1,849
Organophosphates	--- ¹	570	570
Pyrethrins	900	---	900
Sulfonamides/National	19,600	3,519	23,119
Triazines	400	---	400
Totals	70,445	22,184	92,629

1 Seven chlorinated organophosphates are included in domestic analyses for chlorinated hydrocarbons.
2 CHC's only.

January, 1990

5.24

Table VI
DOMESTIC AND IMPORT SAMPLE
UNIT ANALYSES--1990

Residue Designation	Total Sample Unit Analyses	Estimated Lab Time Per Analysis (Hours)	Estimated Total Lab Time (X100 Hours)
Antibiotics	23,294	0.55	128.12
Arsenic	3,409	0.51	17.39
Benzimidazoles	5,351	0.85	45.48
Carbadox	2,721	2.00	54.42
Carbamates	1,300	3.00	39.00
Chloramphenicol	3,830	0.55	21.07
CHC/COP's	10,401	1.00	104.01
Cyromazine	3,045	1.00	30.45
DES	2,085	1.50	31.28
Dibutyltin dilaurate	1,569	0.90	14.12
Gentian violet ¹	600	---	---
Halofuginone	1,444	2.70	38.99
Ivermectin	5,692	1.15	65.46
Melengestrol acetate	450	2.00	9.00
Nicarbazin	600	1.15	6.90
Nitroimidazoles	1,849	2.00	36.98
Organophosphates (import)	570	3.60	20.52
Pyrethrins ¹	900	---	---
Sulfonamides	23,119	0.95	219.63
Triazines	400	1.50	6.00
Totals	92,629		888.82

1 New methods with unknown time requirements; the 1990 Total Lab Time may differ from the number given in this table.

Table VII
DOMESTIC RESIDUE SAMPLE UNIT ANALYSES--1990

Residue Designation	Monitoring	Surveillance	Exploratory	Totals
Antibiotics/Program	7,400	9,000	---	16,400
STOP	---	3,477	---	3,477
CAST	---	700	---	700
Arsenics	1,900	200	---	2,100
Benzimidazoles	2,500	486	---	2,986
Carbadox	900	408	---	1,308
Carbamates	1,300	---	---	1,300
Chloramphenicol	1,500	500	---	2,000
Chlorinated Hydrocarbons and Organophosphates (CHC/COP's)	4,600	1,813	---	6,413
Cyromazine	1,800	50	---	1,850
DES	1,800	100	---	1,900
Dibutyltin dilaurate	600	900	---	1,500
Gentian violet	---	---	600	600
Halofuginone	1,200	100	---	1,300
Ivermectin	3,300	901	---	4,201
Melengestrol acetate	300	---	---	300
Nicarbazin	600	---	---	600
Nitroimidazoles	600	10	---	610
Pyrethrins	600	300	---	900
Sulfonamides	10,600	9,000	---	19,600
Triazines	400	---	---	400
Totals	41,900	27,945	600	70,445

Table VIII
DOMESTIC MONITORING AND EXPLORATORY
SAMPLE UNIT ANALYSES: LIVESTOCK

Residue Designation	Horses	Bulls/Beef Cows	Dairy Cows	Heifers/ Steers	Bob Calves	Formula- fed Calves	Non-formula Calves	Heavy Calves	Seasonal				Totals
									Lamb	Goats	Hogs	Boars/ Sows	
Antibiotics	300	300	1,200	300	300	1,200	300	300	300	300	600	300	5,700
Arsenic	300	300	300	---	---	---	---	---	---	100	300	---	1,300
Benzimidazoles	---	---	300	300	---	300	300	300	300	100	300	---	2,200
Carbadox	---	---	---	---	---	---	---	---	---	---	600	300	900
Carbamates	---	---	600	---	---	300	300	---	---	---	---	---	1,200
Chloramphenicol	---	---	300	---	300	600	300	---	---	---	---	---	1,500
CHC/COP's	300	300	300	300	---	300	300	300	300	100	300	300	3,100
Cyromazine [Seasonal/Area]	---	---	300	300	---	---	---	---	300	100	---	---	1,000
DES	---	---	---	300	---	600	300	300	300	---	---	---	1,800
Ivermectin	300	300	300	300	---	300	300	300	300	300	300	300	3,300
Melengestrol acetate	---	---	---	300	---	---	---	---	---	---	---	---	300

Table VIII
DOMESTIC MONITORING AND EXPLORATORY
SAMPLE UNIT ANALYSES: LIVESTOCK

Residue Designation	Horses	Bulls/Beef Cows	Dairy Cows	Heifers/ Steers	Bob Calves	Formula- fed Calves	Non-formula Calves	Heavy Calves	Seasonal				Boats/ Sows	Totals
									Sheep/ Lamb	Goats	Hogs	Market		
Nitroimidazoles	---	---	---	---	---	---	---	---	---	---	300	---	---	300
Pyrethrins	---	---	300	---	---	300	---	---	---	---	---	---	---	600
Sulfonamides	300	300	1,200	300	300	1,200	300	300	300	100	3,600	300	300	8,500
Triazines	---	---	---	---	---	---	---	---	300	100	---	---	---	400
Totals	1,500	1,500	5,100	2,400	900	5,100	2,400	1,800	2,400	1,200	6,300	1,500	1,500	32,100

Table IX
DOMESTIC MONITORING AND EXPLORATORY SAMPLE
UNIT ANALYSES: POULTRY AND RABBITS

Residue Designation	Chickens Young	Chickens Mature	Turkeys Young Seasonal	Turkeys Mature Seasonal	Ducks	Geese	Rabbits	Totals
Antibiotics	300	300	300	300	100	100	300	1,700
Arsenic	300	---	300	---	---	---	---	600
Benzimidazoles	300	---	---	---	---	---	---	300
Carbamates	---	---	---	---	100	---	---	100
CHC/COP's	300	300	300	300	100	100	100	1,500
Cyromazine [Seasonal/Area]	300	300	100	---	100	---	---	800
Dibutyltin dilaurate	---	---	600	---	---	---	---	600
Gentian violet [Exploratory]	---	300	300	---	---	---	---	600
Halofuginone	600	---	600	---	---	---	---	1,200
Nicarbazin	300	300	---	---	---	---	---	600
Nitroimidazoles	---	---	300	---	---	---	---	300
Sulfonamides	600	300	600	300	100	100	100	2,100
Totals	3,000	1,800	3,400	900	500	300	500	10,400

Table X
ESTIMATED IMPORT SAMPLE UNIT ANALYSES -1990

Residue Designation

Antibiotics	2,717
Arsenic	1,309
Benzimidazoles	2,365
Carbadox	1,413
Chloramphenicol	1,830
Chlorinated Hydrocarbons	3,988
Cyromazine	1,195
DES	185
Dibutyltin dilaurate	69
Halofuginone	144
Ivermectin	1,491
Melengestrol acetate	150
Nitroimidazoles	1,239
Organophosphates	570
Sulfonamides	3,519
Total	22,184

Table XI
ESTIMATED IMPORT SAMPLE UNIT ANALYSES--1990

Residue Designation	Beef	Pork	Veal	Mutton/ Lamb	Goats	Poultry	Totals
Antibiotics	1,211	822	308	166	55	155	2,717
Arsenic	---	1,110	---	---	55	144	1,309
Benzimidazoles	808	1,167	169	166	55	---	2,365
Carbadox	---	1,413	---	---	---	---	1,413
Chloramphenicol	768	672	169	166	55	---	1,830
Chlorinated Hydrocarbons	1,903	1,448	219	166	55	197	3,988
Cyromazine	780	---	---	166	55	194	1,195
DES	153	---	32	---	---	---	185
Dibutyltin dilaurate	---	---	---	---	---	69	69
Halofuginone	---	---	---	---	---	144	144
Ivermectin	598	672	---	166	55	---	1,491
Melengestrol acetate	150	---	---	---	---	---	150
Nitroimidazoles	---	1,178	---	---	---	61	1,239
Organophosphates	570	---	---	---	---	---	570
Sulfonamides	1,380	1,421	308	166	55	189	3,519
Totals	8,321	9,903	1,205	1,162	440	1,153	22,184

Table XII
ESTIMATED IMPORT SAMPLE UNIT
ANALYSES PER COUNTRY-1990

Country	Beef	Pork	Veal	Mutton/lamb	Goats	Poultry ¹	Totals
Argentina	595	---	---	---	---	---	595
Australia	1,643	405	408	630	320	---	3,406
Belgium	---	300	---	---	---	---	300
Brazil	420	---	---	---	---	---	420
Canada	1,523	2,700	376	56	---	526	5,181
Costa Rica	321	---	48	---	---	---	369
Czechoslovakia	---	172	---	---	---	---	172
Denmark	606	1,950	---	---	---	---	2,556
Dominican Republic	652	---	---	---	---	---	652
El Salvador	154	---	---	---	---	---	154
Finland	---	855	---	---	---	---	855
France	---	60	---	---	---	74	134
Germany	---	120	---	---	---	---	120
Guatemala	179	---	---	---	---	---	179
Honduras	187	---	---	---	---	---	187
Hong Kong	---	---	---	---	---	163	163
Hungary	48	540	---	---	---	---	588
Iceland	---	---	---	56	---	---	56
Ireland	96	48	---	---	---	---	144
Israel	---	---	---	---	---	350	350
Italy	40	48	---	---	---	---	88
Netherlands	68	425	---	---	---	---	493
New Zealand	1,345	48	373	420	120	---	2,306
Poland	---	675	---	---	---	---	675
Romania	---	318	---	---	---	---	318
Sweden	270	738	---	---	---	---	1,008
Switzerland	32	48	---	---	---	---	80
United Kingdom	---	---	---	---	---	40	40
Uruguay	98	---	---	---	---	---	98
Yugoslavia	44	453	---	---	---	---	497
Totals	8,321	9,903	1,205	1,162	440	1,153	22,184

¹Includes chickens, turkeys, ducks, geese, and guinea fowl.

Table XIII
SAMPLING RATES FOR IMPORTED PRODUCTS
(INDIVIDUAL COUNTRY BASIS)

Monitoring Activity Sampling

<i>Pounds Imported/Year</i>	<i>Total Samples/Year</i>
1-100,000 lbs.	8 samples
100,000-1,000,000 lbs.	8 plus 2 for each 100,000 lbs.
1,000,000-25,000,000 lbs.	35 plus 2 for each 1,000,000 lbs.
25,000,000-1,000,000,000 lbs.	85 plus 1 for each 1,000,000 lbs.

The above criteria are used as the starting point for import product sampling. The actual numbers arrived at are modified according to a compound's evaluation and ranking, and FSIS laboratory capabilities.

Table XIV
ESTIMATED ANNUAL VOLUME OF
IMPORTED BEEF

Country	Estimated Annual Imports (lbs)	Fresh Product (lbs)	Processed Product (lbs)
Argentina	106,381,181	---	106,381,181
Australia	792,974,714	789,453,015	3,521,699
Brazil	67,443,180	---	67,443,180
Canada	147,705,385	140,091,720	7,613,665
Costa Rica	53,109,059	53,109,059	---
Denmark	7,128,261	7,119,189	9,072
Dominican Republic	32,222,758	32,222,758	---
El Salvador	2,258,802	2,258,802	---
France	1,617	--	1,617
Guatemala	23,232,987	23,232,987	---
Honduras	22,114,847	22,114,847	---
Hungary	163,800	--	163,800
Ireland	408,464	309,300	99,164
Italy	28,312	--	28,312
Netherlands	194,376	--	194,376
New Zealand	473,861,753	472,732,632	1,129,121
Sweden	1,445,428	1,445,428	---
Switzerland	36,467	---	36,467
Uruguay	4,451,135	---	4,451,135
Yugoslavia	644,994	---	644,994

Table XV
ESTIMATED BEEF MONITORING SAMPLE UNIT ANALYSES
FOR FRESH (F) AND PROCESSED (P) PRODUCTS--1990

Country	Anti- biotics F	Benzimid- azoles F/P	Chloram- phenicol F	Chlorinated		DES F	Ivermectin F	Melen- gestrol acetate F	Organo- phos- phates F/P	Sulfon- amides F/P	Total Est. Sample Unit Analyses
				Hydro- carbons F/P	Cyroma- zine F/P						
Argentina	---	85	---	200	85	---	---	---	75	150	595
Australia	300	150	150	300	150	43	150	---	100	300	1,643
Brazil	---	65	---	150	65	---	---	---	50	90	420
Canada	300	80	150	300	80	8	80	150	75	300	1,523
Costa Rica	20	20	100	100	8	8	20	---	25	20	321
Denmark	88	88	88	88	88	8	88	---	30	40	606
Dominican Republic	90	90	90	150	90	16	90	---	20	16	652
El Salvador	16	16	16	38	16	8	16	---	12	16	154
Guatemala	20	12	24	71	8	8	12	---	12	12	179

Table XV
ESTIMATED BEEF MONITORING SAMPLE UNIT ANALYSES
FOR FRESH (F) AND PROCESSED (P) PRODUCTS--1990

Country	Anti- biotics F	Benzimid- azoles F/P	Chloram- phenicol F	Chlorinated Hydro- carbons F/P	Cyroma- zine F/P	DES F	Ivermectin F	Melen- gestrol acetate F	Organo- phos- phates F/P	Sulfona- mides F/P	Total Est. Samples
Honduras	20	12	20	75	8	8	12	---	12	20	187
Hungary	---	10	---	10	10	---	---	---	8	10	48
Ireland	20	8	8	8	8	8	8	---	8	20	96
Italy	---	8	---	8	8	---	---	---	8	8	40
Netherlands	---	10	---	30	10	---	---	---	8	10	68
New Zealand	300	85	85	300	85	30	85	---	75	300	1,345
Sweden	37	37	37	37	37	8	37	---	10	30	270
Switzerland	---	8	---	8	8	---	---	---	---	8	32
Uruguay	---	16	---	22	8	---	---	---	30	22	98
Yugoslavia	---	8	---	8	8	---	---	---	12	8	44
Totals	1,211	808	768	1,903	780	153	598	150	570	1,380	8,321

Table XVI
ESTIMATED ANNUAL VOLUME OF
IMPORTED PORK

Country	Estimated Annual Imports (lbs)	Fresh Product (lbs)	Processed Product (lbs)
Australia	3,123,714	3,122,814	900
Belgium	7,420,184	---	7,420,184
Canada	531,801,128	492,473,093	39,328,035
Czechoslovakia	2,487,128	---	2,487,128
Denmark	266,753,643	122,552,608	144,201,035
Finland	7,548,860	3,659,060	3,889,800
France	288,376	---	288,376
Germany	597,187	---	597,187
Hungary	32,353,658	---	32,353,658
Ireland	180,699	---	180,699
Italy	11,022	---	11,022
Netherlands	17,469,414	---	17,469,414
New Zealand	90,942	90,942	---
Poland	86,619,746	---	86,619,746
Romania	9,975,709	---	9,975,709
Sweden	23,437,378	21,635,607	1,801,771
Switzerland	107,083	---	107,083
Yugoslavia	27,209,992	---	27,209,992

Table XVII
IMPORTED PORK MONITORING SAMPLE UNIT ANALYSES FOR
FRESH (F) AND/OR PROCESSED (P) PRODUCTS--1990

Country	Antibiotics F	Arsenic F/P	Benzimidazoles F/P	Carbadox F/P	Chloram- phenicol F	Chlorinated Hydrocarbons		Ivermectin F	Nitroimida- zoles		Sulfona- mides F/P	Total Est. Sample Unit Analyses
						F/P	F/P		F/P	F/P		
Australia	45	45	45	45	45	45	45	45	45	45	45	405
Belgium	---	50	50	50	---	50	50	---	50	50	50	300
Canada	300	300	300	300	300	300	300	300	300	300	300	2,700
Czechoslovakia	---	8	8	39	---	39	39	---	39	39	39	172
Denmark	300	150	150	300	150	300	300	150	150	300	300	1,950
Finland	95	95	95	95	95	95	95	95	95	95	95	855
France	---	12	12	12	---	12	12	---	---	12	12	60
Germany	---	20	20	20	---	20	20	---	20	20	20	120
Hungary	---	90	90	90	---	90	90	---	90	90	90	540
Ireland	---	8	8	8	---	8	8	---	---	16	16	48
Italy	---	8	8	8	---	8	8	---	8	8	8	48
Netherlands	---	65	65	65	---	100	100	---	65	65	65	425
New Zealand	---	8	8	8	---	8	8	---	8	8	8	48
Poland	---	80	80	145	---	145	145	---	80	145	145	675
Romania	---	53	53	53	---	53	53	---	53	53	53	318
Sweden	82	82	82	82	82	82	82	82	82	82	82	738
Switzerland	---	8	8	8	---	8	8	---	8	8	8	48
Yugoslavia	---	28	85	85	---	85	85	---	85	85	85	453
Totals	822	1,110	1,167	1,413	672	1,448	1,448	672	1,178	1,421	1,421	9,903

Table XVIII
IMPORTED VEAL ESTIMATED SAMPLE UNIT ANALYSES
FOR FRESH (F) AND PROCESSED (P) PRODUCT—1990

Country	Est. annual Imports (lbs)	Antibiotics F	Benzimidazoles F/P	Chloramphenicol F	Chlorinated Hydrocarbons F/P	DES F	Sulfonamides F/P	Total Est. Sample Unit Analyses
Australia	9,573,881	100	50	50	100	8	100	408
Canada	10,448,392	100	56	56	56	8	100	376
Costa Rica	64,078	8	8	8	8	8	8	48
New Zealand	10,441,376	100	55	55	55	8	100	373
Totals		308	169	169	219	32	308	1,205

Table XIX
IMPORTED MUTTON AND LAMB ESTIMATED SAMPLE UNIT ANALYSES
FOR FRESH (F) AND PROCESSED (P) PRODUCT—1990

Country	Est. Annual Imports (lbs)	Antibiotics F	Benzimida-zoles F/P	Chloram-phenicol F	Chlorinated Hydrocarbons F/P	Cyromazine F/P	Ivermectin F	Sulfonamides F/P	Total Est. Sample Unit Analyses
Australia	29,766,837	90	90	90	90	90	90	90	630
Canada	74,016	8	8	8	8	8	8	8	56
Iceland	36,382	8	8	8	8	8	8	8	56
New Zealand	12,700,701	60	60	60	60	60	60	60	420
Totals		166	166	166	166	166	166	166	1,162

Table XX
IMPORTED DUCK/GEESE/GUINEA FOWL SAMPLE UNIT ANALYSES FOR
FRESH (F) AND PROCESSED (P) PRODUCT--1990

Country	Est. Annual Imports (lbs)	Antibiotics F	Chlorinated Hydrocarbons F/P	Cyromazine F/P	Dibutyltin dilaurate F	Sulfonamides F/P	Total Est. Sample Unit Analyses
Canada	1,260,183	35	35	35	35	35	175
France	110,898	10	10	10	10	10	50
Israel	19,673	8	8	8	---	8	32
Totals		53	53	53	45	53	257

Table XXI
IMPORTED TURKEY SAMPLE UNIT ANALYSES FOR
FRESH (F) AND PROCESSED (P) PRODUCT--1990

Country	Est. Annual Imports (lbs)	Antibiotics F	Arsenic F/P	Chlorinated Hydrocarbons F/P	Cyromazine F/P	Dibutyltin dilaurate F	Halofuginone F/P	Nitroimidazoles F/P	Sulfonamides F/P	Total Est Sample Unit Analyses
Canada	735,511	12	12	12	12	8	12	12	12	92
Hong Kong	968,523	15	15	15	15	8	15	15	15	113
Israel	359,334	34	34	34	34	---	34	34	34	238
United Kingdom	---	---	8	8	8	---	8	---	8	40
Totals		61	69	69	69	16	69	61	69	483

1 Poundage not presently available; minimum number of sample unit analyses performed.

Table XXII
IMPORTED POULTRY (CHICKEN) SAMPLE UNIT ANALYSES
FOR FRESH (F) AND PROCESSED (P) PRODUCT--1990

Country	Est. Annual Imports (lbs)	Antibiotics F	Arsenic F/P	Chlorinated Hydrocarbons F/P	Cyromazine F/P	Dibutyltin dilaurate F	Halofuginone F/P	Sulfonamides F/P	Total Est. Sample Unit Analyses
Canada	4,479,904	41	41	41	46	8	41	41	259
France	1,101	---	8	8	---	---	8	---	24
Hong Kong	214,100	---	10	10	10	---	10	10	50
Israel	686,183	---	16	16	16	---	16	16	80
Totals		41	75	75	72	8	75	67	413

Table XXIII
IMPORTED GOAT SAMPLE UNIT ANALYSES
FOR FRESH (F) PRODUCT--1990

Country	Est. Annual Imports (lbs)	Antibiotics F	Arsenic F	Benzimida zoles- F	Chloram- phenicol F	Chlorinated Hydrocarbons F	Cyromazine F	Ivermectin F	Sulfonamides F	Total Est. Sample Unit Analyses
Australia	1,738,172	40	40	40	40	40	40	40	40	320
New Zealand	27,804	15	15	15	15	15	15	15	15	120
Totals		55	55	55	55	55	55	55	55	440

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COMPOUNDS CONSIDERED AND CRITERIA FOR EVALUATION

RESIDUE LIMITS

FSIS RESIDUE ANALYTICAL CAPABILITY

NATIONAL RESIDUE PROGRAM--Ten Year History

NATIONAL RESIDUE PROGRAM PLAN January--December, 1990